Single Aisle
TECHNICAL TRAINING MANUAL
GENERAL FAMILIARIZATION COURSE - T4 (IAE V2500)
AVIONICS LEVEL 1

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AVIONICS LEVEL 1

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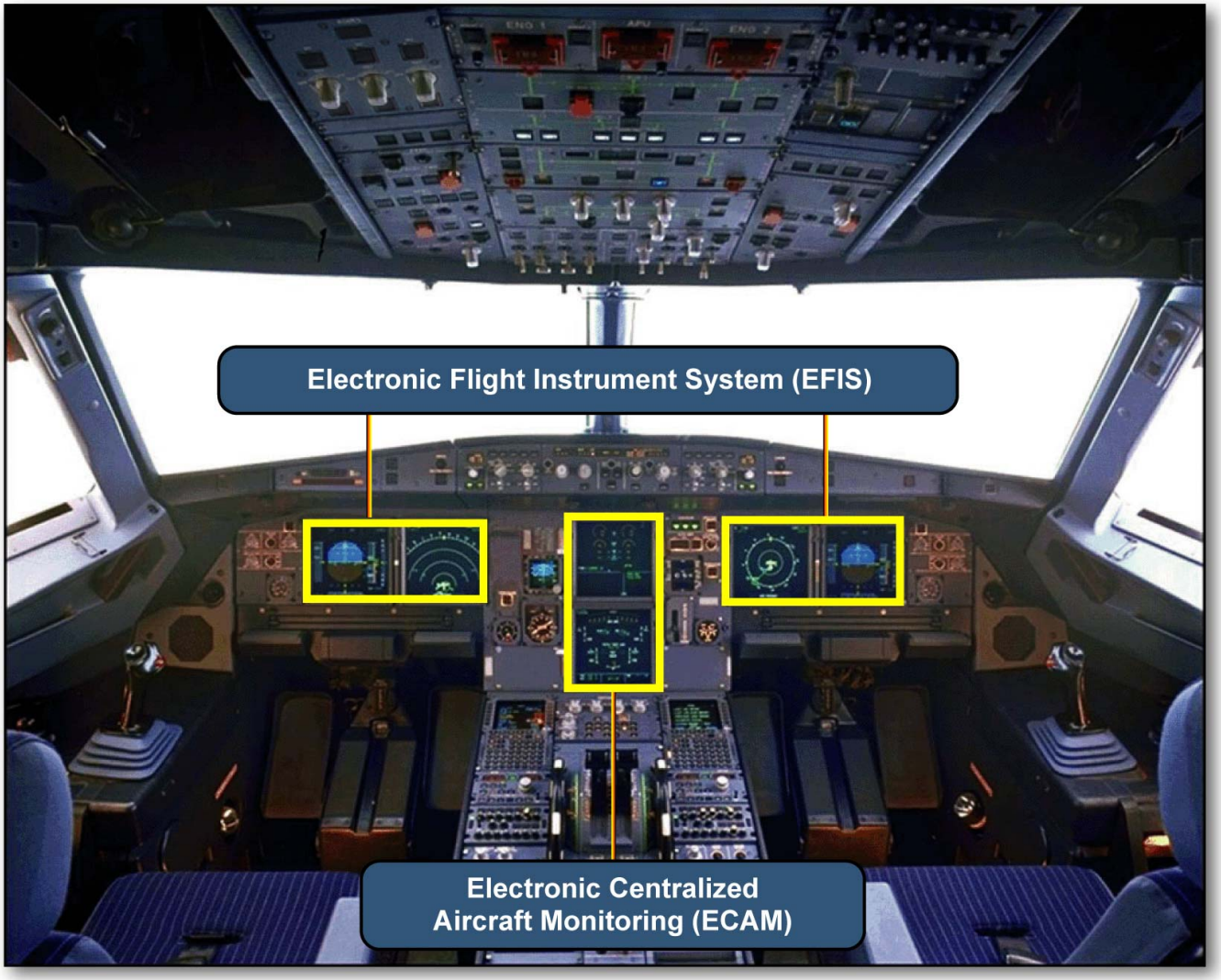
UGB13131 - U2AT4M0

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ELECTRONIC INSTRUMENT SYSTEM

The Single Aisle aircraft cockpit instrumentation information is displayed on six display units. These display units are part of the Electronic Instrument System (EIS).
The EIS is separated into two subsystems:
- Electronic Flight Instrument System (EFIS),
- Electronic Centralized Aircraft Monitoring (ECAM).

The four EFIS displays (2 for each flight crew member) give to the flight crew all the basic flight parameters. The ECAM system gives to the flight crew aircraft system displays, faults, checklists and the aircraft operational status.



ELECTRONIC INSTRUMENT SYSTEM

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ELECTRONIC INSTRUMENT SYSTEM (continued)

ECAM

The System Data Acquisition Concentrators (SDACs) receive data from the A/C systems and sends it to the Display Management Computers (DMCs) for display on the ECAM display units.

NOTE: Note: DMC 1 supplies both ECAM displays and DMC 2 is also a backup for ECAM displays.

The DMCs acquire data and transmit it to the Display Units (DUs), which generate the images. Under normal circumstances:
- DMC 1 supplies both ECAM display,
- DMC 2 and 3 are available as a backup.

The Flight Warning Computers (FWCs), heart of the ECAM system, receive data from:
- the A/C systems to generate red warnings,
- the SDACs to generate amber cautions.

The FWCs then supply:
- the DMCs for the display of alert messages,
- the attention getters,
- the loudspeakers with aural alerts and synthetic voice messages.

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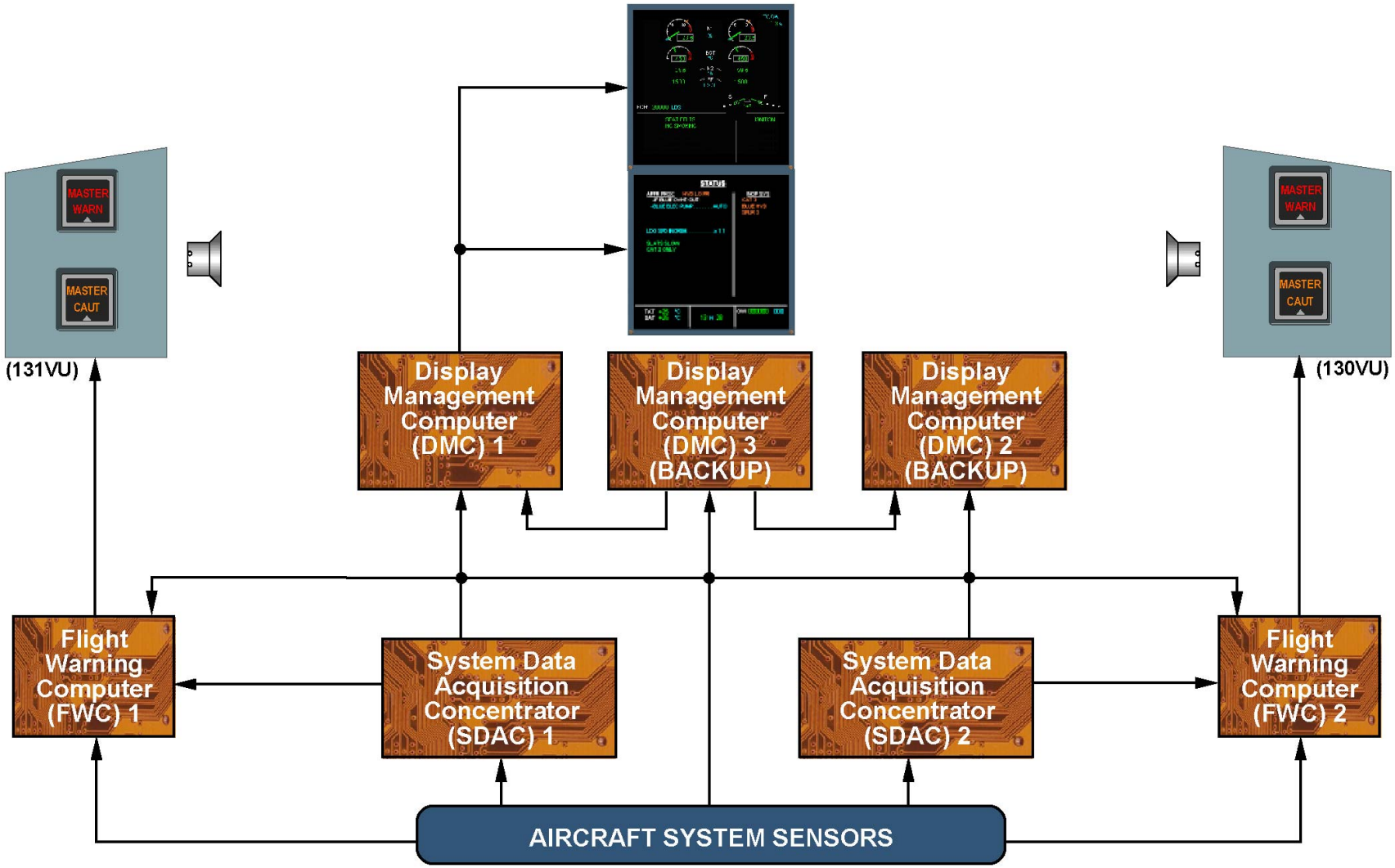

ELECTRONIC INSTRUMENT SYSTEM - ECAM

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ELECTRONIC INSTRUMENT SYSTEM (continued)

ECAM CONTROL AND INDICATING

The Engine/Warning Display (EWD) is divided into two main parts:
- the upper area is used to display the main engine parameters, the Fuel On Board (FOB) and the slat/flap position,
- the lower area is used for warning, caution and memo messages.

The System Display (SD) is divided into two areas:
- the upper part is used to display the various system pages, diagrams of the A/C systems,
- the lower part is used to display permanent data.

Below the ECAM displays, on the center pedestal, there is the ECAM control panel. The two control knobs on the LH side are used to adjust the brightness of the two ECAM screens and to turn them off. The P/Bs on the RH side are mainly used to:
- display any of the system pages or the STATUS page,
- clear or recall a warning or caution message.

An A/C STATUS page may be also displayed on the SD to give an operational status of the A/C. When things are not normal the STATUS page displays:
- operational data on the LH side,
- INOPerative SYStem on the RH side.

In front of each pilot, there are two attention getters, a red MASTER WARNing and an amber MASTER CAUTion. As a further means of getting the attention, there is a loudspeaker on each side of the cockpit for aural alerts and synthetic voice messages.

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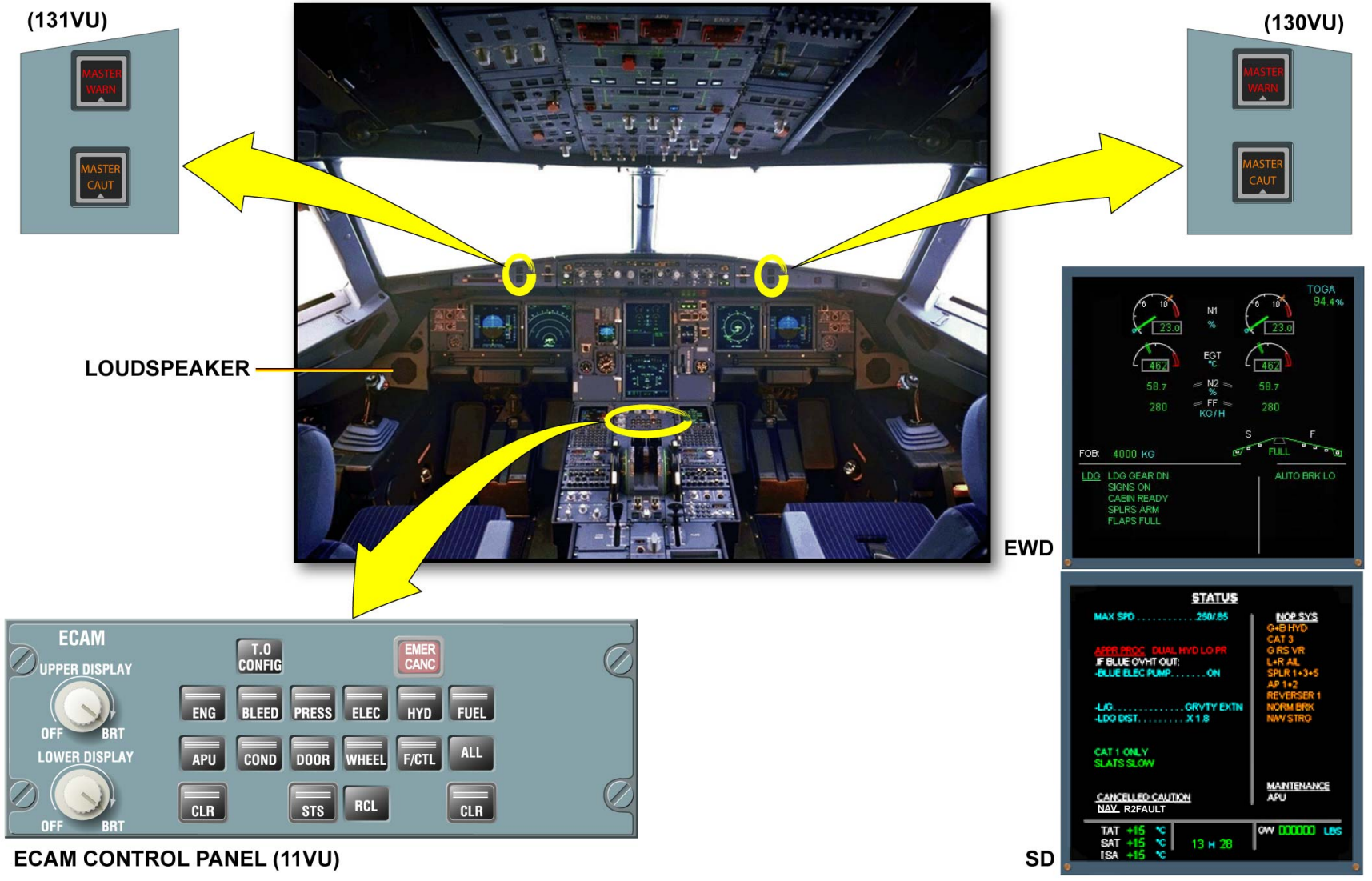

ELECTRONIC INSTRUMENT SYSTEM - ECAM CONTROL AND INDICATING

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ELECTRONIC INSTRUMENT SYSTEM (continued)

EFIS

For the EFIS displays, data from the Air Data and Inertial Reference System (ADIRS) plus navigation data from the Flight Management and Guidance System (FMGS) is fed directly to the DMCs.
The DMCs then process the data and generate the images to display.
Under normal circumstances:
- DMC 1 supplies the CAPT EFIS displays,
- DMC 2 supplies the F/O EFIS displays,
- DMC 3 is available as a backup.

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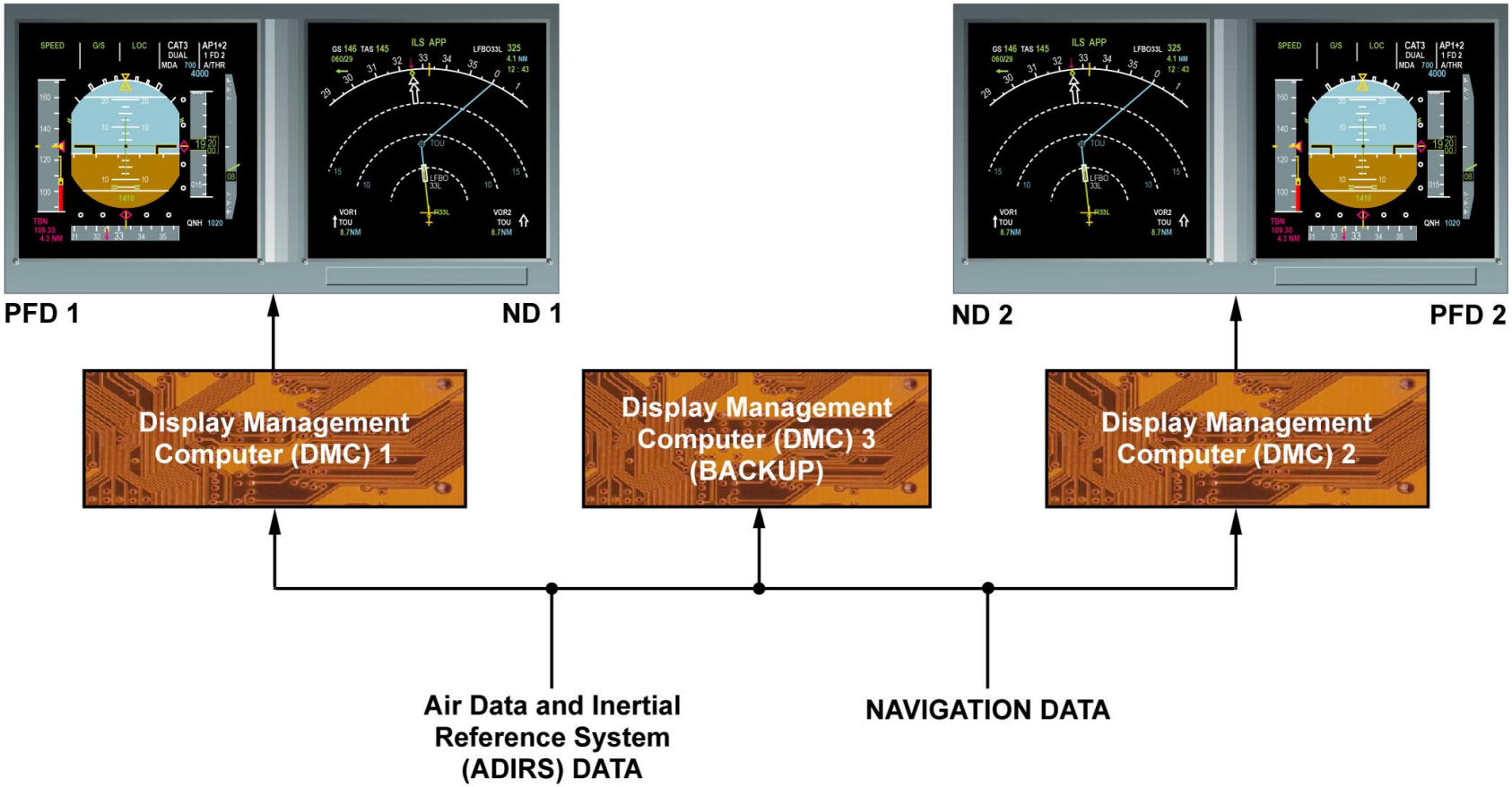

ELECTRONIC INSTRUMENT SYSTEM - EFIS

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ELECTRONIC INSTRUMENT SYSTEM (continued)

EFIS CONTROL AND INDICATING

Flight parameters are displayed on the Primary Flight Display (PFD) while navigation data is displayed on the Navigation Display (ND). Outboard of the PFDs, there are control knobs to adjust the brightness of the associated PFD and ND, and to turn the displays off.
Two EFIS control panels are used to select what is displayed on the EFIS screens. The EFIS control panels are divided into two sections, one section associated with the PFD and the other one with the ND.
Just below the ECAM screens, on the center pedestal, there is a switching panel with, on the right, 2 rotary selectors to restore data to the EFIS and ECAM displays in abnormal operation.

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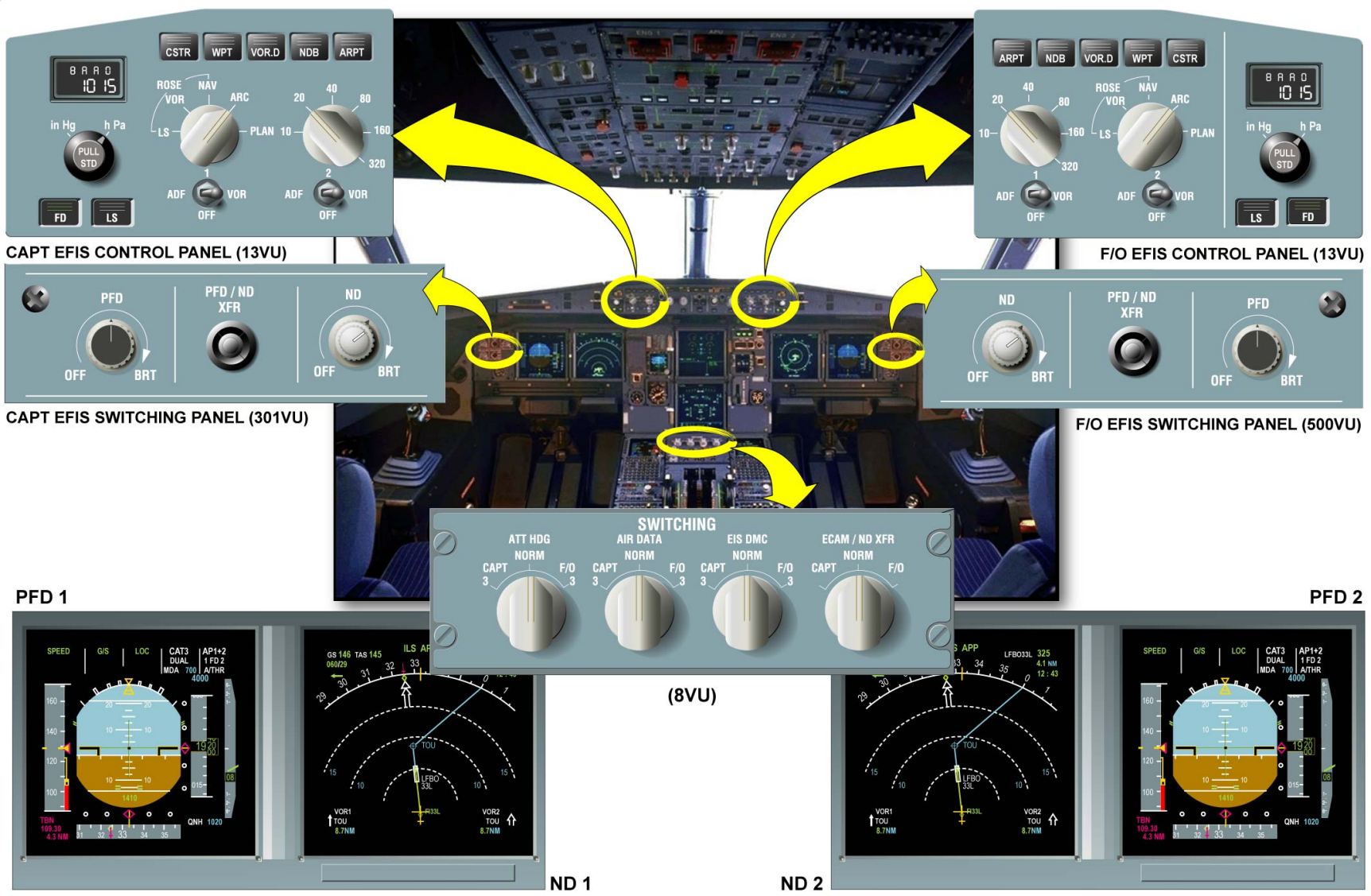

ELECTRONIC INSTRUMENT SYSTEM - EFIS CONTROL AND INDICATING

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

CLOCK

A single electrical clock gives the Universal Time Coordinated (UTC) and date as time references for the crew and all peripheral systems. The other functions available for crew are Elapsed Time (ET) and chronometer (CHR). The clock can be synchronized with satellite GPS time.
The time is also displayed at the bottom of the SD.

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DOOR/OXY
OXY 1850 PSI
SLIDE
SLIDE
SLIDE
SLIDE
----CARGO
SLIDE
SLIDE
TAT +25 °C
SAT +25 °C
13 H 28
GW
SD
RST
CHR
37:28
MIN SEC
CHR
GPS
INT
SET
UTC
13:28 28
HR/MO MIN/DY SEC/Y
SET
DATE
RUN
STP
RST
00:34
HR ET MIN
CLOCK (400VU)

CLOCK

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

CENTRALIZED FAULT DISPLAY SYSTEM

The Centralized Fault Display Interface Unit (CFDIU) centralizes and memorizes all information concerning A/C system failures. Reading or printing of the failure information is done in the cockpit with any Multipurpose Control and Display Unit (MCDU) or the printer. Most A/C system computers have a Build-In Test Equipment (BITE). The BITE permanently monitors the system operation. When a failure is detected, it is stored in the BITE memory and is transmitted to the CFDIU. The ECAM, which generate warning and status messages, delivers these data to the CFDIU as well.

The failure information is available in various reports. The reading of the failure information is made from two different MCDU menus depending on if the A/C is in flight or on ground. The SYSTEM REPORT/TEST function is available on ground only. It enables a dialogue between the CFDIU and a system computer. The SYSTEM REPORT/TEST menu page presents the list of all the systems connected to the CFDIU, in ATA chapter order.

The maintenance Post Flight Report (PFR) can only be printed on ground. It summarizes and displays the list of the ECAM warning messages and the fault messages that occurred during the last flight, with the associated time, flight phase and ATA reference. It helps the maintenance crew to make a correlation for easier troubleshooting.

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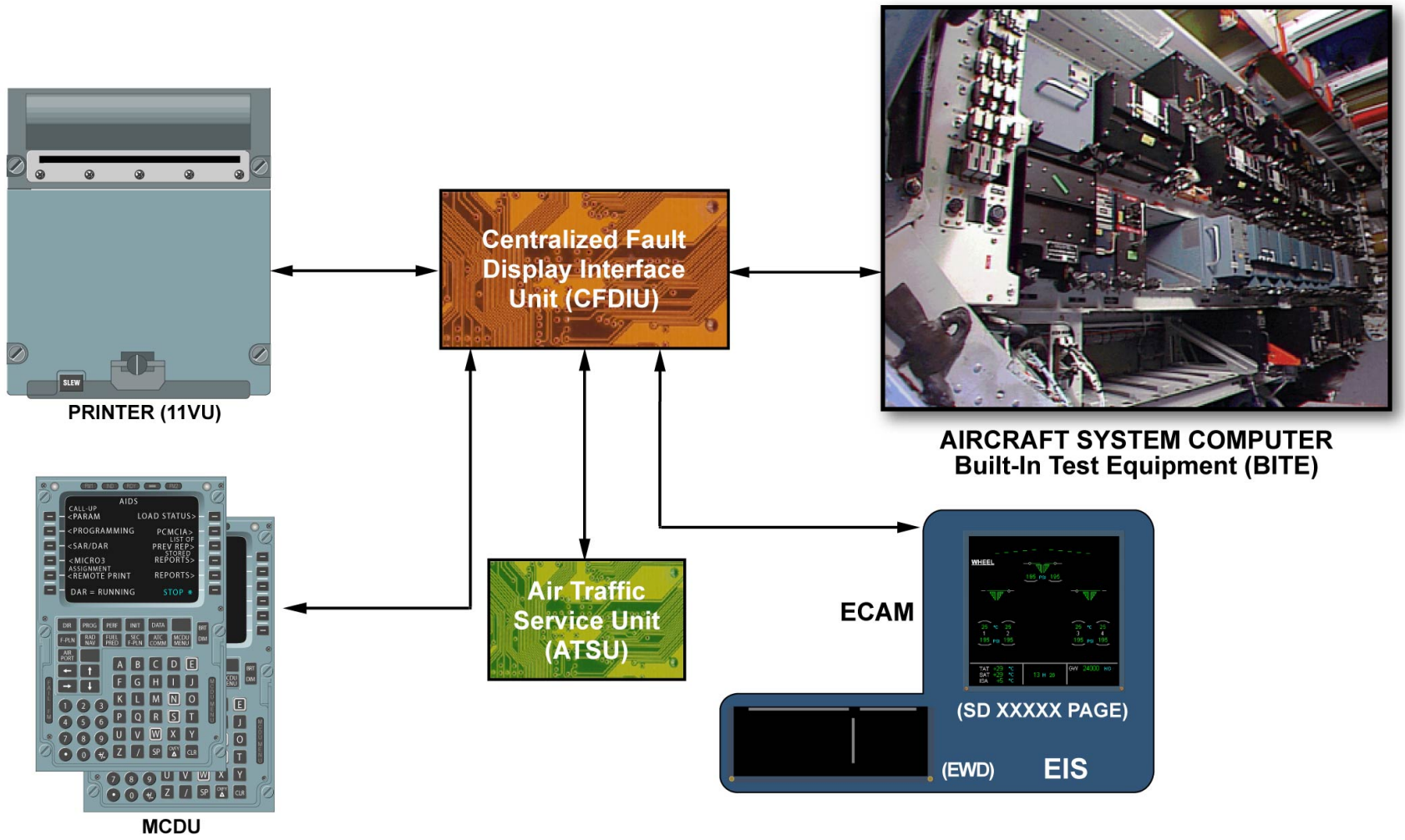
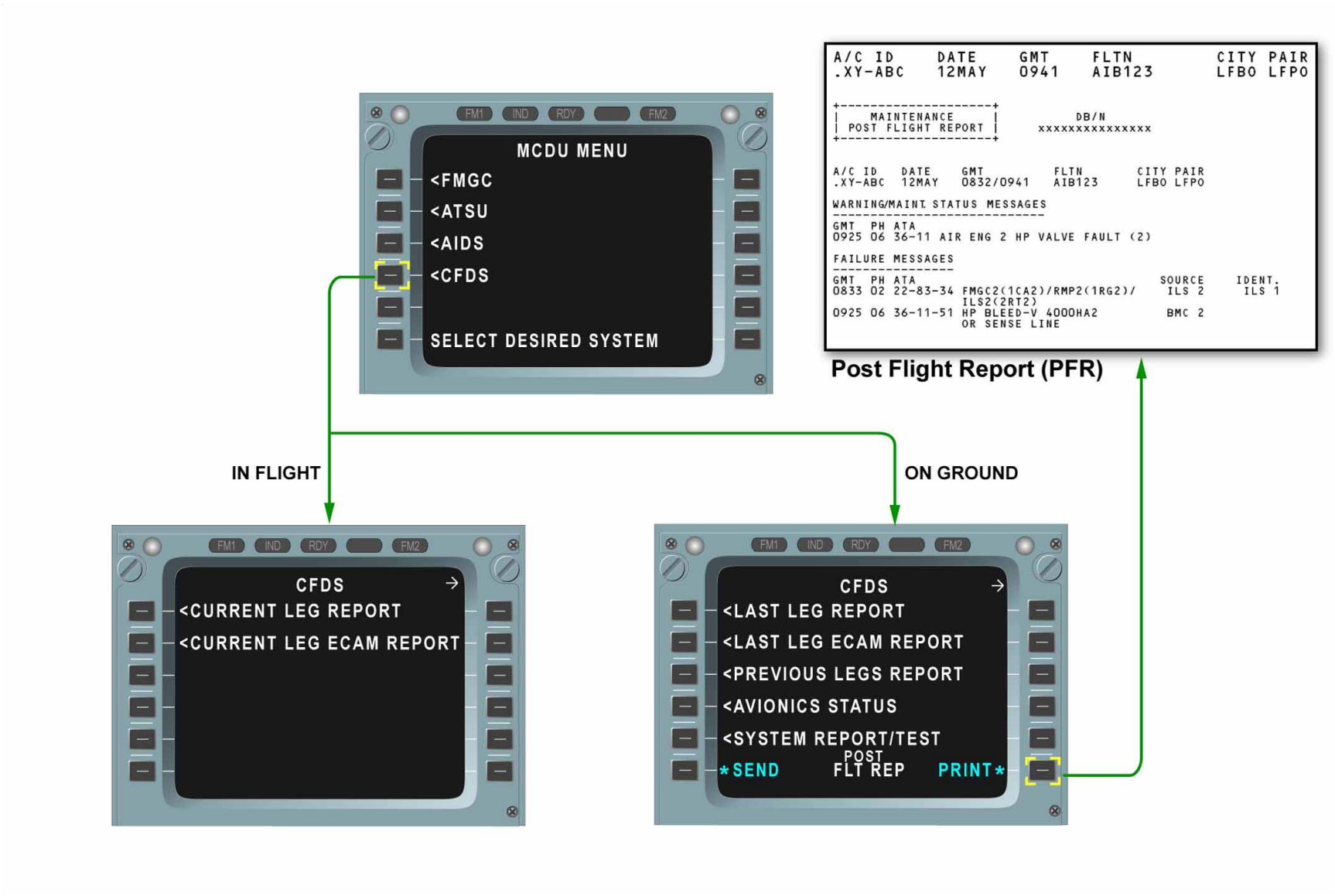


CENTRALIZED FAULT DISPLAY SYSTEM



CENTRALIZED FAULT DISPLAY SYSTEM

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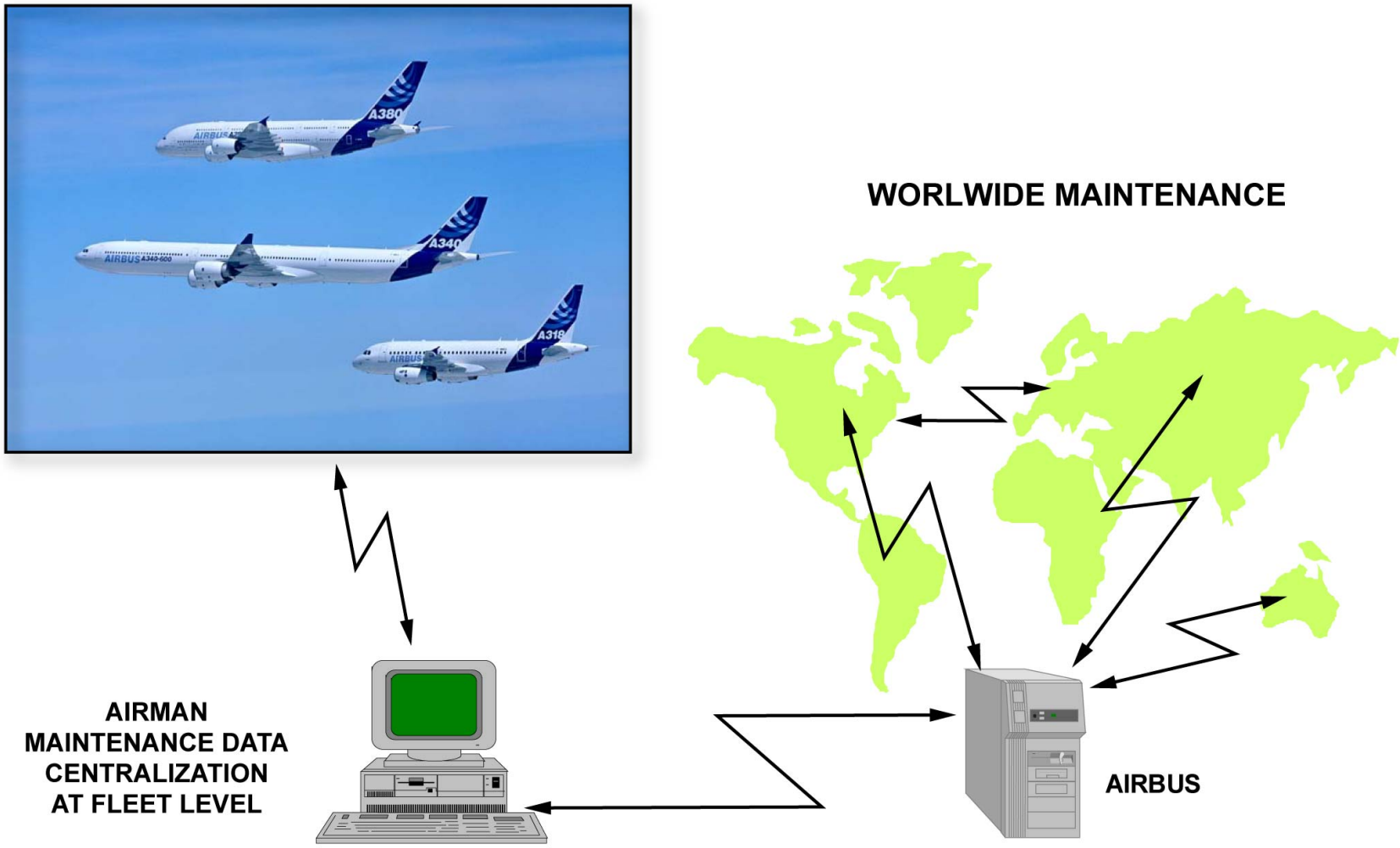
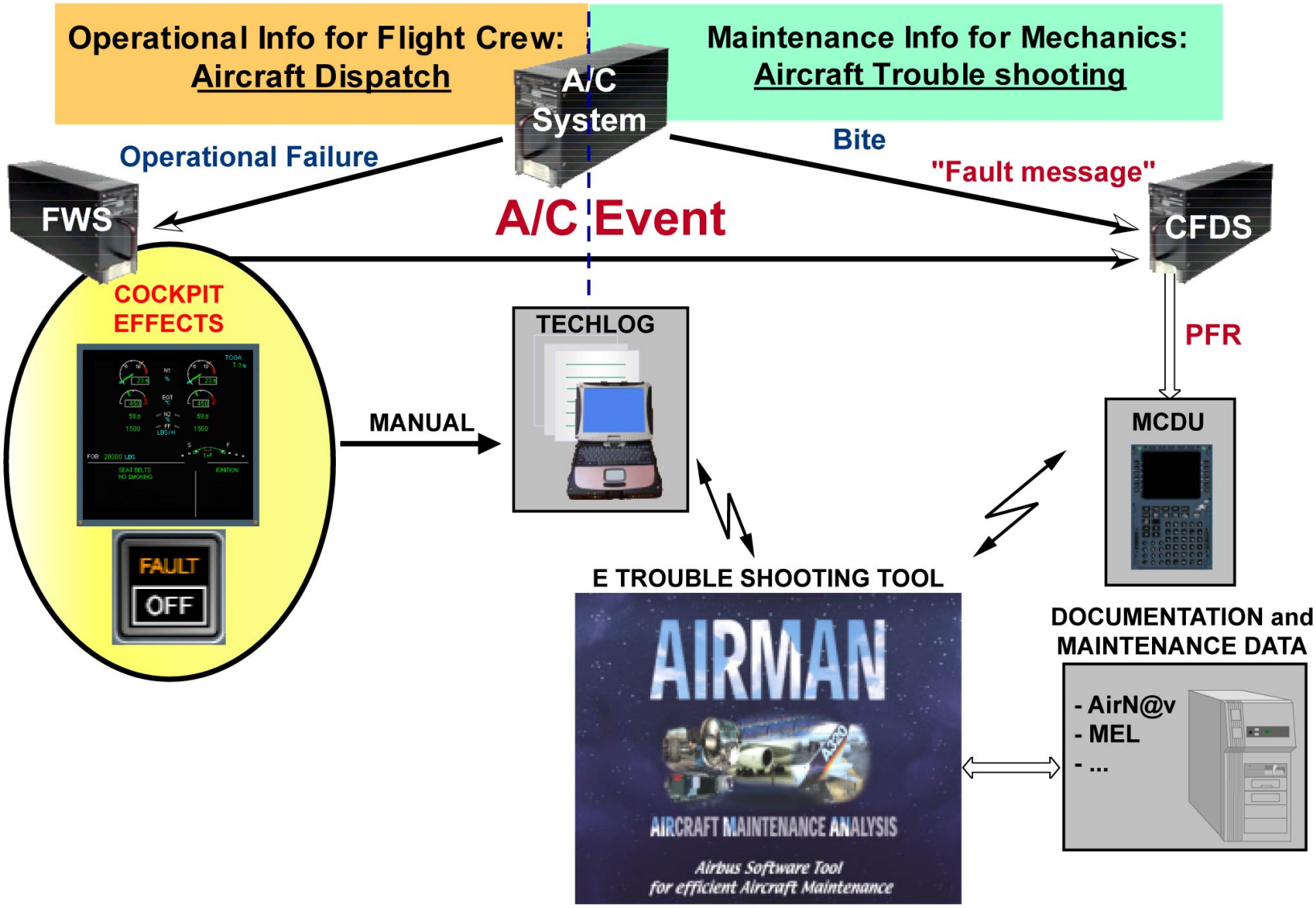
31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

AIRMAN (OPTION)

AIRMAN is a ground-based software dedicated to the identification and the management of unscheduled maintenance.
AIRMAN receives and analyses the aircraft status information generated by the Centralized Fault Display System (CFDS) and also e-logbook data. The information is automatically transmitted to the ground by the aircraft communication system.
These information sources are synthesized, combined with Airbus and the Airline own technical documentation and shown through a user-friendly interface. Aircraft status information is sent to AIRMAN while the aircraft is both in flight and on ground. Message analysis also takes place in real-time.
These capabilities maximize the time available for appropriate maintenance actions to be determined and preparations to be made.
AIRMAN is capable of analyzing an aircraft fault history and consequently identifying and prioritizing preventive maintenance actions.
The aircraft maintenance philosophy is based on the following steps:
- fault detection made by the computers BITEs,
- cockpit effects as flags on Display Units, and warning generated by the Flight Warning System (FWS),
- centralization by the CFDS of BITE faults, cockpit effects and related maintenance procedures generation of Post Flight Report (PFR),
- fault event data reporting through the eLogbook,
- fault event data and reports transmission to AIRMAN for maintenance support on ground.



AIRMAN (OPTION)



AIRMAN (OPTION)

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31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

AIRMAN (OPTION) (continued)

ELOGBOOK

The eLogbook is the main communication means for aircraft operational staff. It enables the flight crew and the technical staff to be aware of the aircraft status, to enter aircraft defect and to report maintenance and servicing actions.
The eLogbook lets the flight crew:
o consult the Logbook status
o accept / create a new flight
o report aircraft defects
o hand over to maintenance
The maintenance staff uses the eLogbook to:
o consult the aircraft status
o report aircraft defects
o report corrective or scheduled maintenance actions
o report servicing actions
o build the Certificate of Release into Service (CRS) of the aircraft
Finally the cabin crew can also use the eLogbook to:
o consult the aircraft status
o inform the flight crew about regulatory cabin defects
o report none regulatory cabin defects
The eLogbook runs on a fully stand-alone laptop and is not connected to the aircraft. The eLogbook is stowed in the cockpit by the flight crew.

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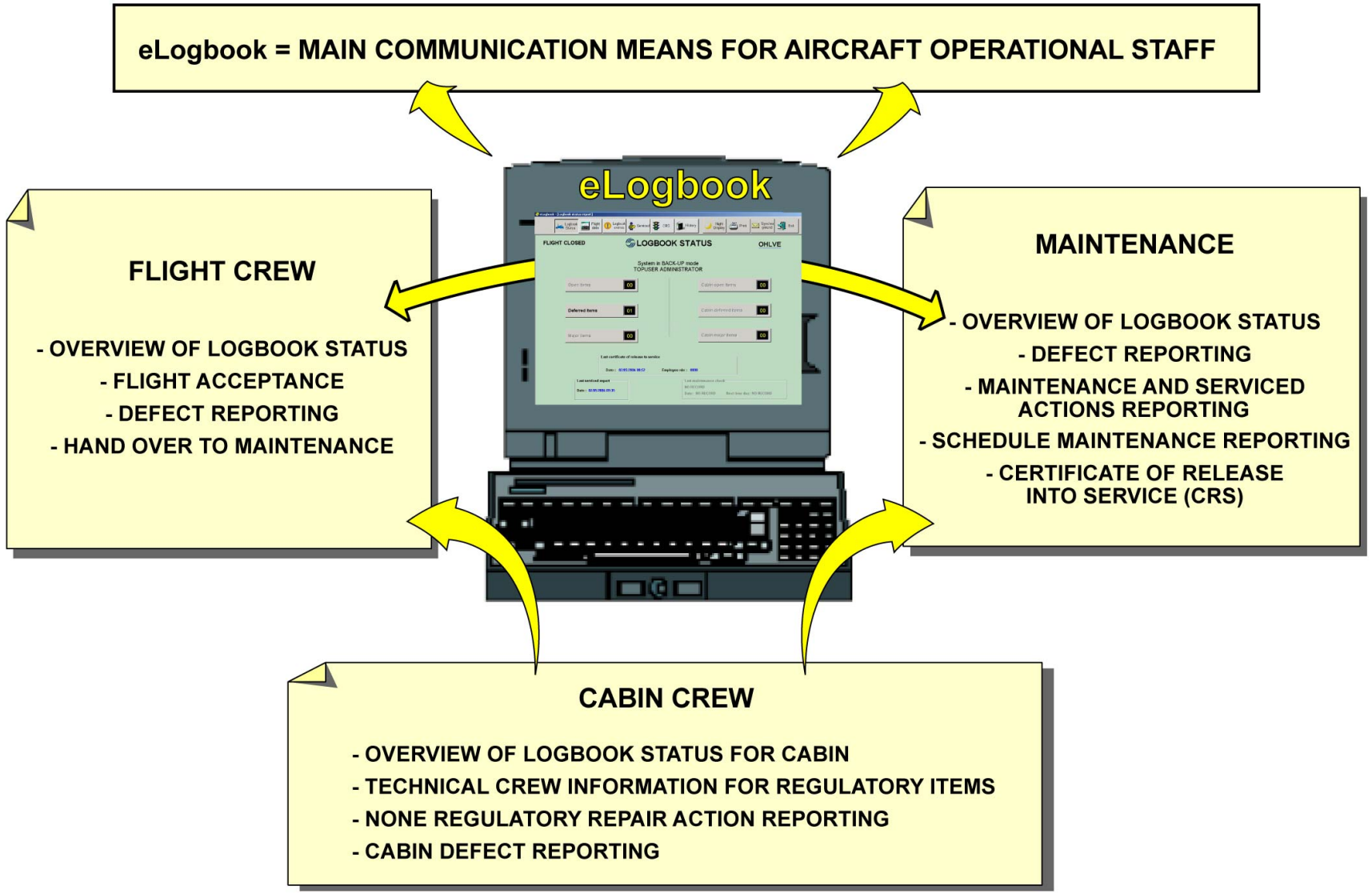
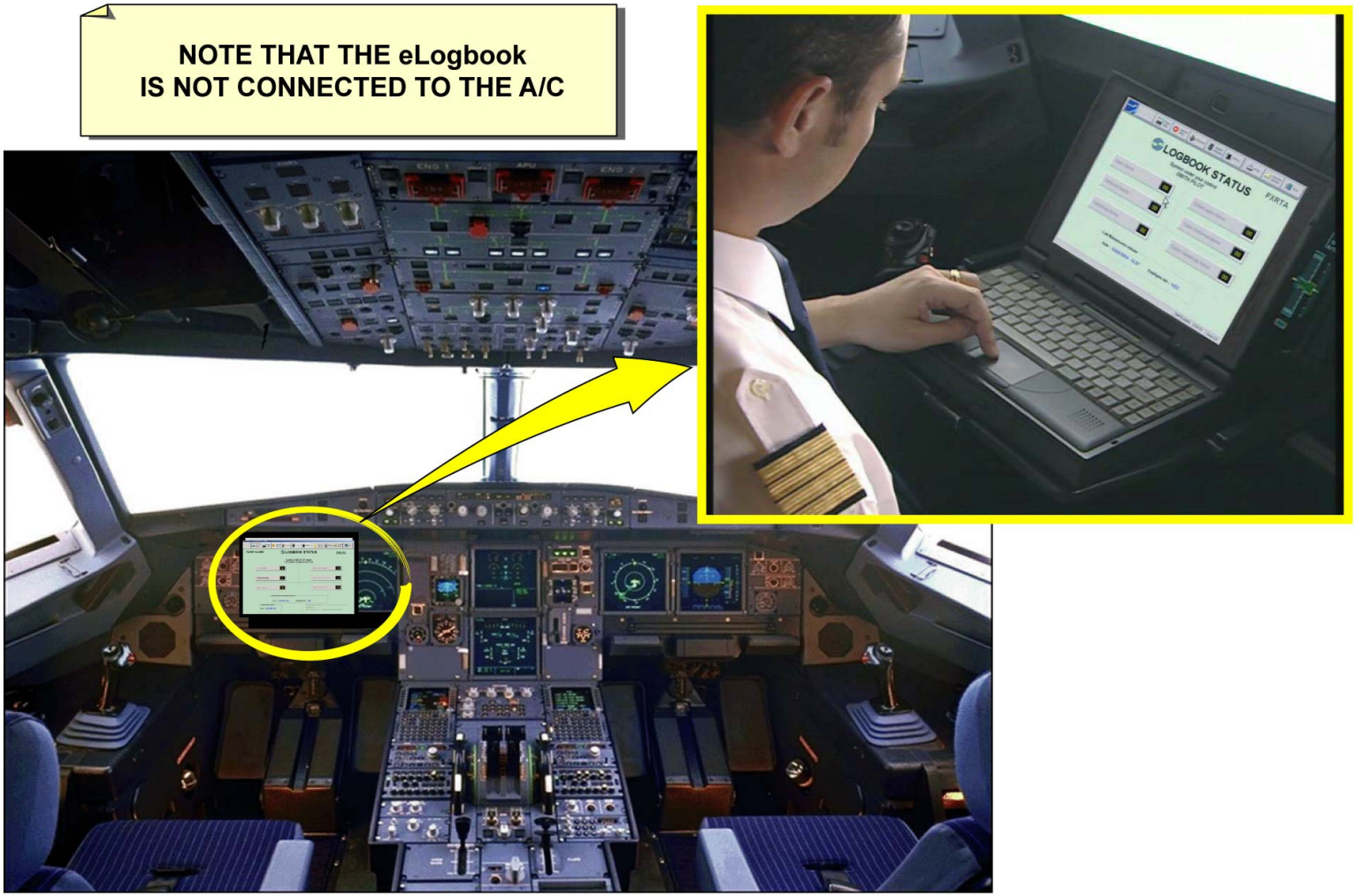

eLogbook = MAIN COMMUNICATION MEANS FOR AIRCRAFT OPERATIONAL STAFF
eLogbook
FLIGHT CREW
- OVERVIEW OF LOGBOOK STATUS
- FLIGHT ACCEPTANCE
- DEFECT REPORTING
- HAND OVER TO MAINTENANCE
MAINTENANCE
- OVERVIEW OF LOGBOOK STATUS
- DEFECT REPORTING
- MAINTENANCE AND SERVICED ACTIONS REPORTING
- SCHEDULE MAINTENANCE REPORTING
- CERTIFICATE OF RELEASE INTO SERVICE (CRS)
CABIN CREW
- OVERVIEW OF LOGBOOK STATUS FOR CABIN
- TECHNICAL CREW INFORMATION FOR REGULATORY ITEMS
- NONE REGULATORY REPAIR ACTION REPORTING
- CABIN DEFECT REPORTING

AIRMAN (OPTION) - ELOGBOOK



AIRMAN (OPTION) - ELOGBOOK

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31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

DIGITAL FLIGHT DATA RECORDING

The Flight Data Interface and Management Unit (FDIMU) has two primary functions. The first of which is the Flight Data Interface Unit (FDIU) function.
To fulfill the mandatory requirements of crash recording, the FDIU acquires and formats various critical flight parameters and system data before supplying the Solid State Flight Data Recorder (SSFDR).
The linear accelerometer measures the acceleration of the A/C in all three axes. The System Data Acquisition Concentrator (SDAC) digitizes the analog signal of the linear accelerometer and sends it to the FDIU.
For maintenance and performance purposes, the optional Quick Access Recorder (QAR) records the same parameters as the SSFDR. The operation of the SSFDR is automatic when at least one engine is running.
On the overhead panel, there is a GrouND ConTroL P/B located on the ReCorDeR panel. This P/B lets the SSFDR be supplied when the A/C is on ground for preflight checks before engine start or for test and maintenance purposes. On the center pedestal, there is a Digital Flight Data Recorder (DFDR) EVENT P/B, which can be used to set an event mark on the SSFDR memory.

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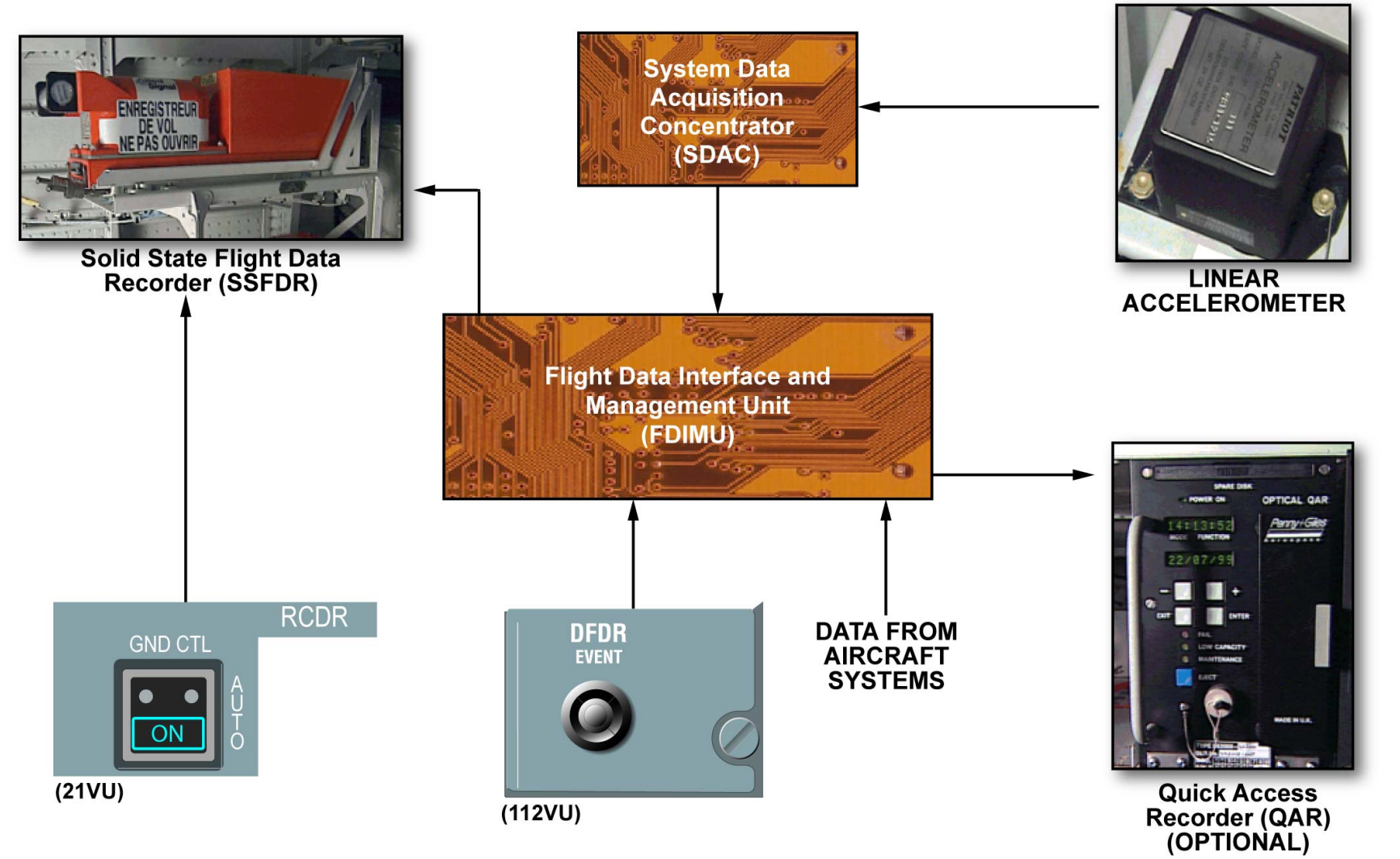

DIGITAL FLIGHT DATA RECORDING

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

AIRCRAFT INTEGRATED DATA SYSTEM

The main functions of the Aircraft Integrated Data System (AIDS) are to monitor engine condition, APU condition and A/C performance, and to provide trouble shooting assistance. The second main function of the FDIMU is the DMU function which houses the Aircraft Integrated Data System (AIDS).
The Data Management Unit (DMU) is the heart of the AIDS. It fulfils the following functions:
- collection, processing and recording of various A/C parameters, including the mandatory parameters given by the FDIU. The recording is made in an internal memory of the DMU and on an optional external recorder called Digital AIDS Recorder (DAR),
- generate various reports according to defined conditions. These reports are stored in a non-volatile memory of the DMU.

A data loader is used to upload programmed data into the DMU and to download recorded DMU data on a floppy disk for on ground analysis.
The printer is used to print reports generated by the DMU.
The printer can be automatically controlled by the DMU, manually controlled from the MCDU or using the AIDS PRINT P/B on the center pedestal.
The FDMIU has a PCMCIA card slot to upload DMU software and download DMU data.
In the A/C, two MCDUs are connected to the DMU.
To initiate communication with the AIDS via either MCDU, the user has to press the AIDS line select key from the MCDU MENU page. The AIDS MCDU menu page is then displayed.
Some of the AIDS functions, including real time parameter read out, may be controlled from this menu.

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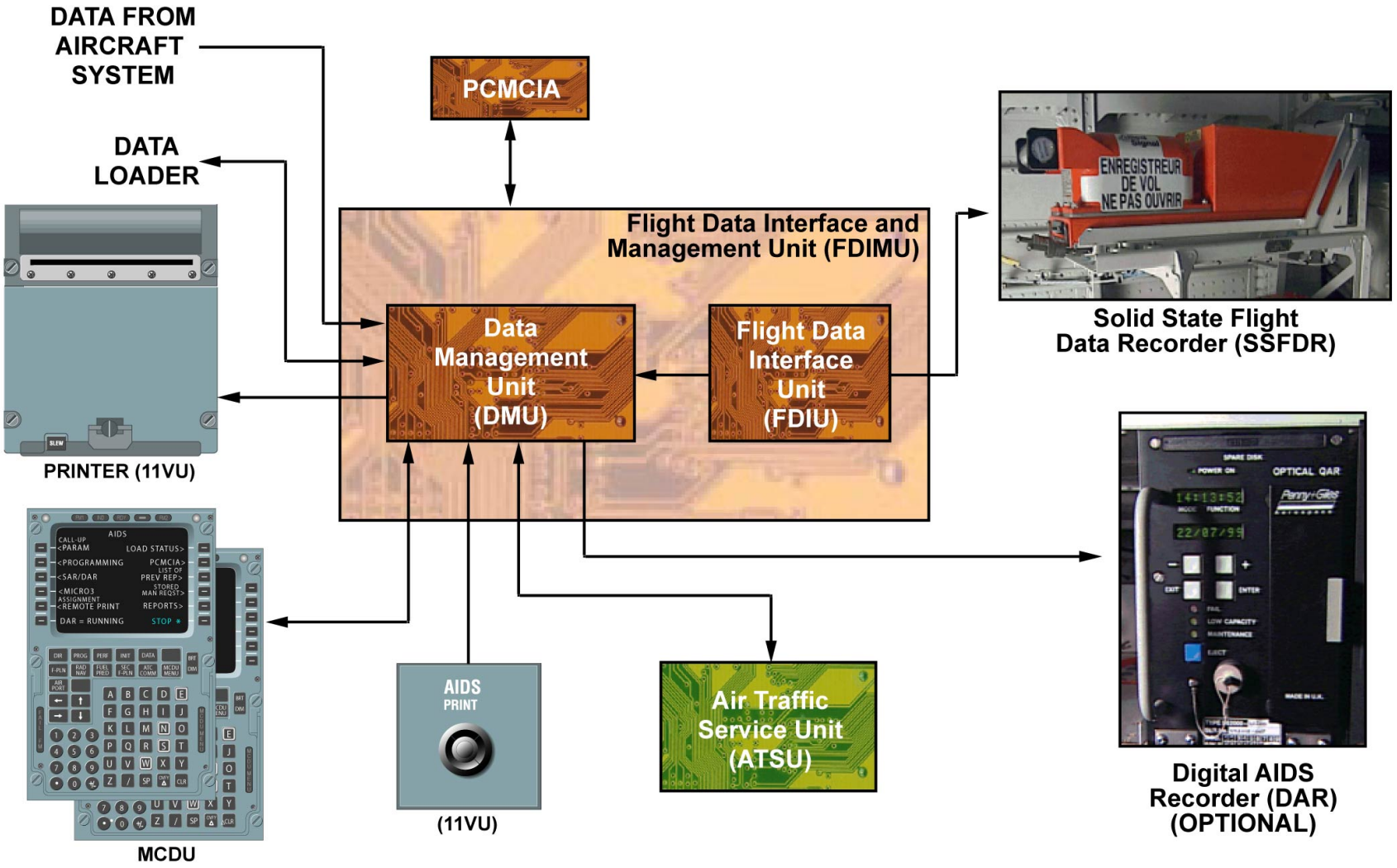
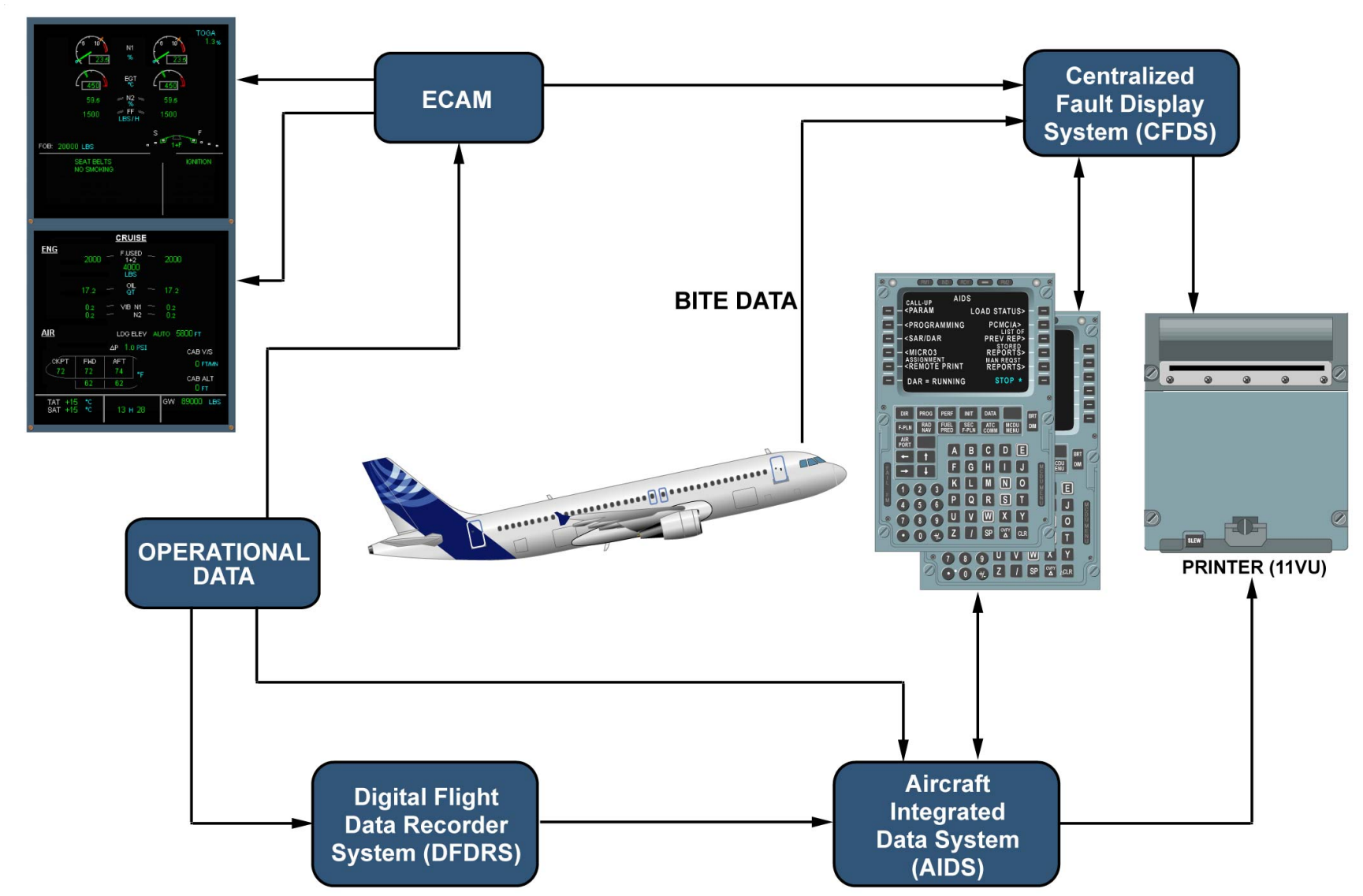


AIRCRAFT INTEGRATED DATA SYSTEM

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

ON BOARD MAINTENANCE FACILITIES

In this graphic all the indicating/recording systems can be seen together.



ON BOARD MAINTENANCE FACILITIES

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Using the MCDU, you can have access to the CFDS fault messages of all the indicating/recording systems.
Specific BITE tests are available as well.
ECAM 1 and 2 gives access to FWC 1/2, SDAC 1/2 and ECAM control panel.
EIS 1 gives access to DMC 1, PFD 1, ND 1, Upper ECAM and Lower ECAM.
EIS 2 gives access to DMC 2, PFD 2 and ND 2.
EIS 3 gives access to DMC 3.

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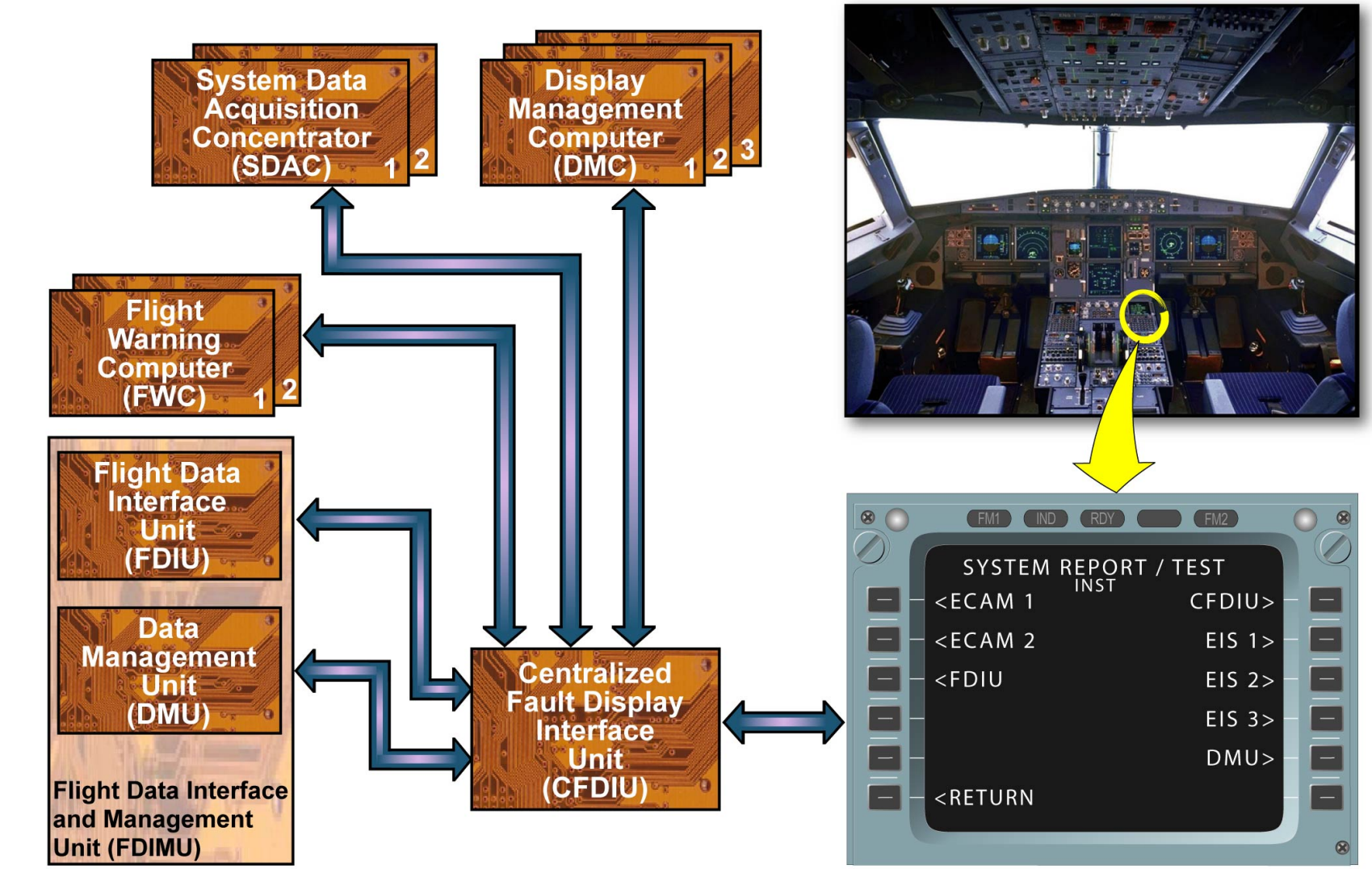

MAINTENANCE/TEST FACILITIES

31 INDICATING/RECORDING SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

For maintenance operations, respect the AMM procedures.

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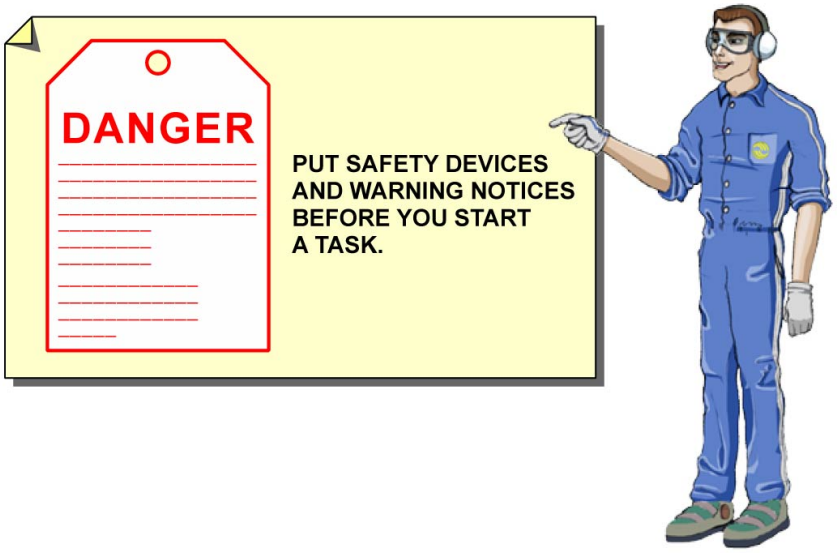

SAFETY PRECAUTIONS

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GENERAL

There are two identical engine driven generators called Integrated Drive Generators (IDGs). They are used as the main power source to supply the A/C electrical network.
The IDG basically contains, in a common housing, a generator and a Constant Speed Drive (CSD). The CSD gives a constant input speed to the generator, which is required for a constant output frequency.
Each generator supplies 115V 400Hz AC to its own bus:
- generator 1 supplies AC bus 1,
- generator 2 supplies AC bus 2.

This supply is known as split operation, which means that the AC power sources are never connected in parallel.
Each AC bus supplies a Transformer Rectifier (TR):
- AC bus 1 supplies TR 1,
- AC bus 2 supplies TR 2.

The TRs convert 115V AC into 28V DC to supply their associated DC buses, DC 1 and DC 2.
DC bus 1 then supplies the DC BAT bus.
The DC battery bus can charge the batteries or receive power from the batteries as a backup supply, if no other power sources are available.
The electrical system also includes two ESSential (ESS) Buses. One is the AC ESS bus fed by AC bus 1 and the other is the DC ESS bus fed by DC bus 1. These buses are used to supply the most critical A/C systems.
This is the basic electrical system. We will now introduce some other components, which also supply the system.
The entire electrical network can also be supplied by the APU generator.
On the ground, the aircraft electrical network can be supplied by an external power source.
Any one of the power sources can supply the entire electrical network.
As no parallel connection is allowed on this A/C (split operation), we have to give priorities to the different power sources in supplying the bus bars.
AC 1 and AC 2 buses are supplied in priority by their own side generator, then the external power, then the APU generator and then by the opposite generator.

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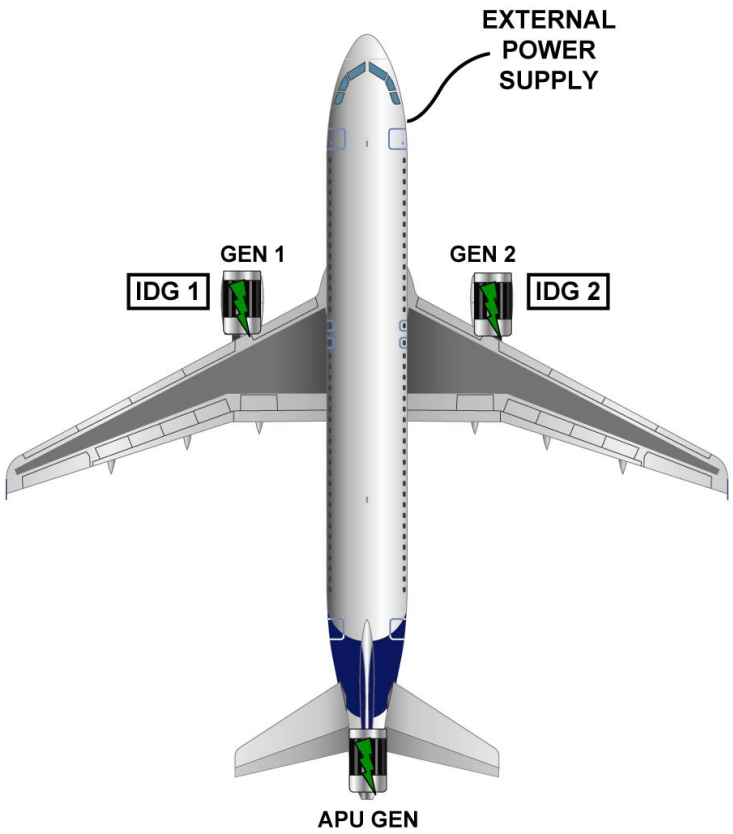
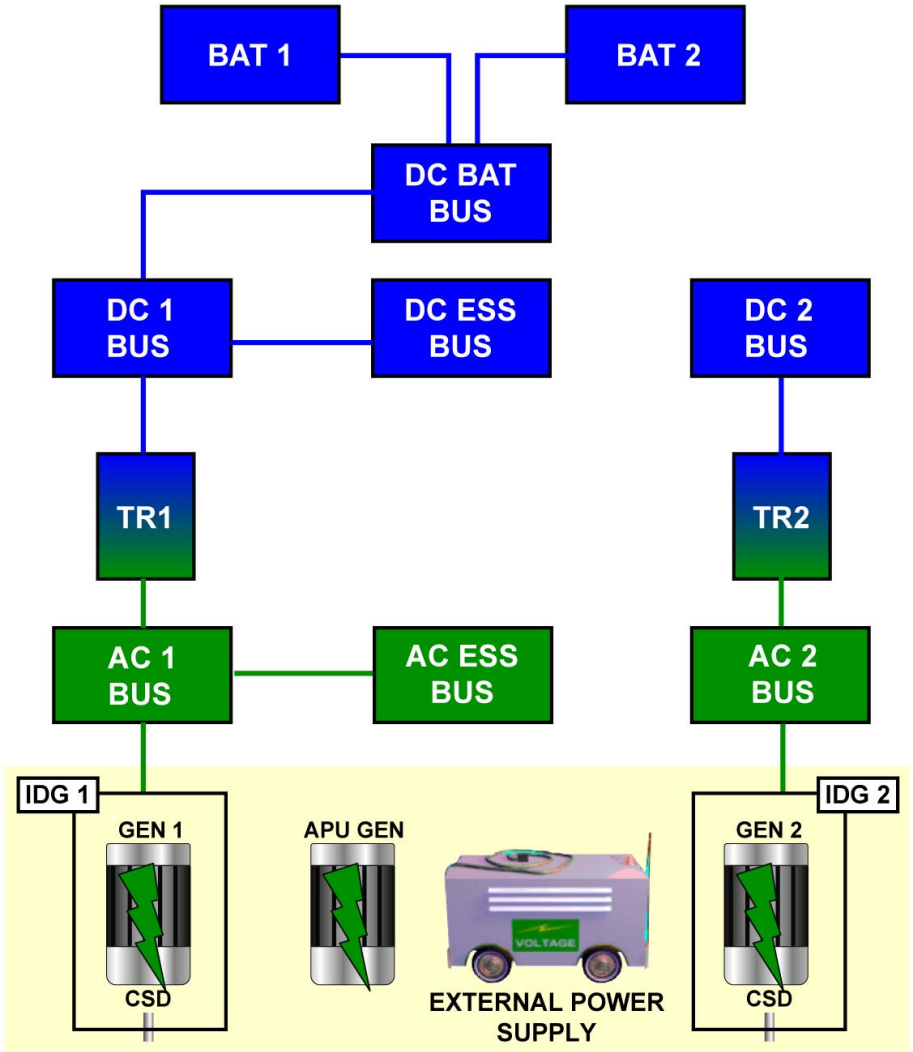

EXTERNAL
POWER
SUPPLY
GEN 1
GEN 2
IDG 1
IDG 2
APU GEN
Integrated Drive Generator (IDG)
Constant Speed Drive (CSD)
Transformer Rectifier (TR)
Battery (BAT)
Essential (ESS)
Generator (GEN)


BAT 1
BAT 2
DC BAT
BUS
DC 1
BUS
DC ESS
BUS
DC 2
BUS
TR1
TR2
AC 1
BUS
AC ESS
BUS
AC 2
BUS
IDG 1
GEN 1
CSD
APU GEN
EXTERNAL POWER
SUPPLY
IDG 2
GEN 2
CSD

GENERAL

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GENERAL (continued)

ABNORMAL CONFIGURATION

The electrical system has an ESS TR, which supplies the DC ESS Bus in abnormal or emergency configuration.
In abnormal configuration (loss of TR1 or TR2) the ESS TR is supplied by the AC ESS Bus.

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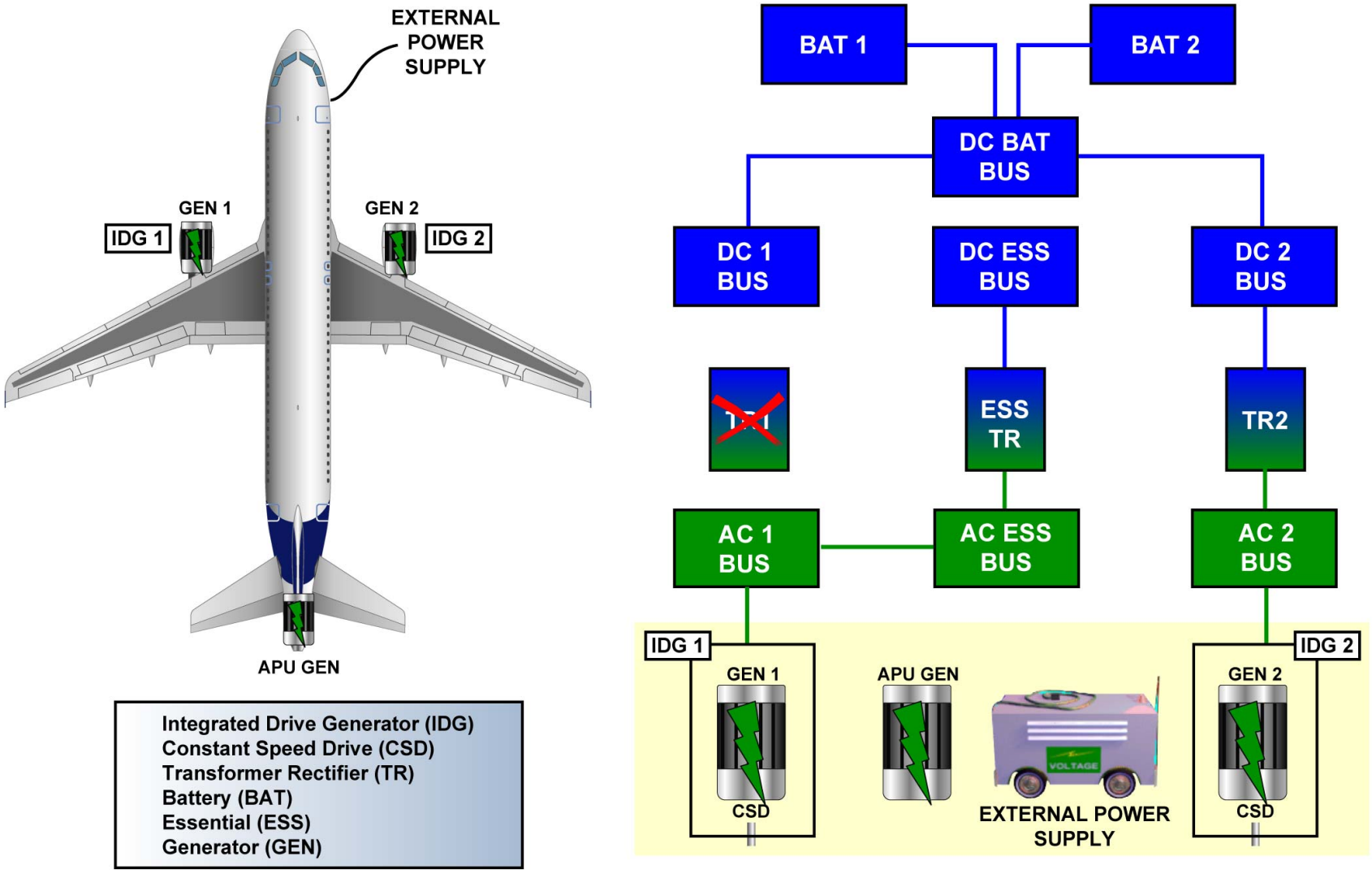

GENERAL - ABNORMAL CONFIGURATION

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GENERAL (continued)

EMERGENCY CONFIGURATION

In the event of emergency operation, the Emergency Generator (EMER GEN) supplies the A/C with electrical power. The EMER GEN needs hydraulic power to operate. This hydraulic power to drive the EMER GEN is supplied by the Blue Hydraulic system via the Ram Air Turbine (RAT). The RAT is located in the belly fairing and extends automatically when AC BUS 1 and 2 have no voltage supply.
Then, the EMER GEN supplies the DC ESS BUS directly through the ESS TR. In emergency configuration (loss of AC BUS 1 and AC BUS 2) the EMER GEN supplies the ESS TR and the AC ESS BUS.

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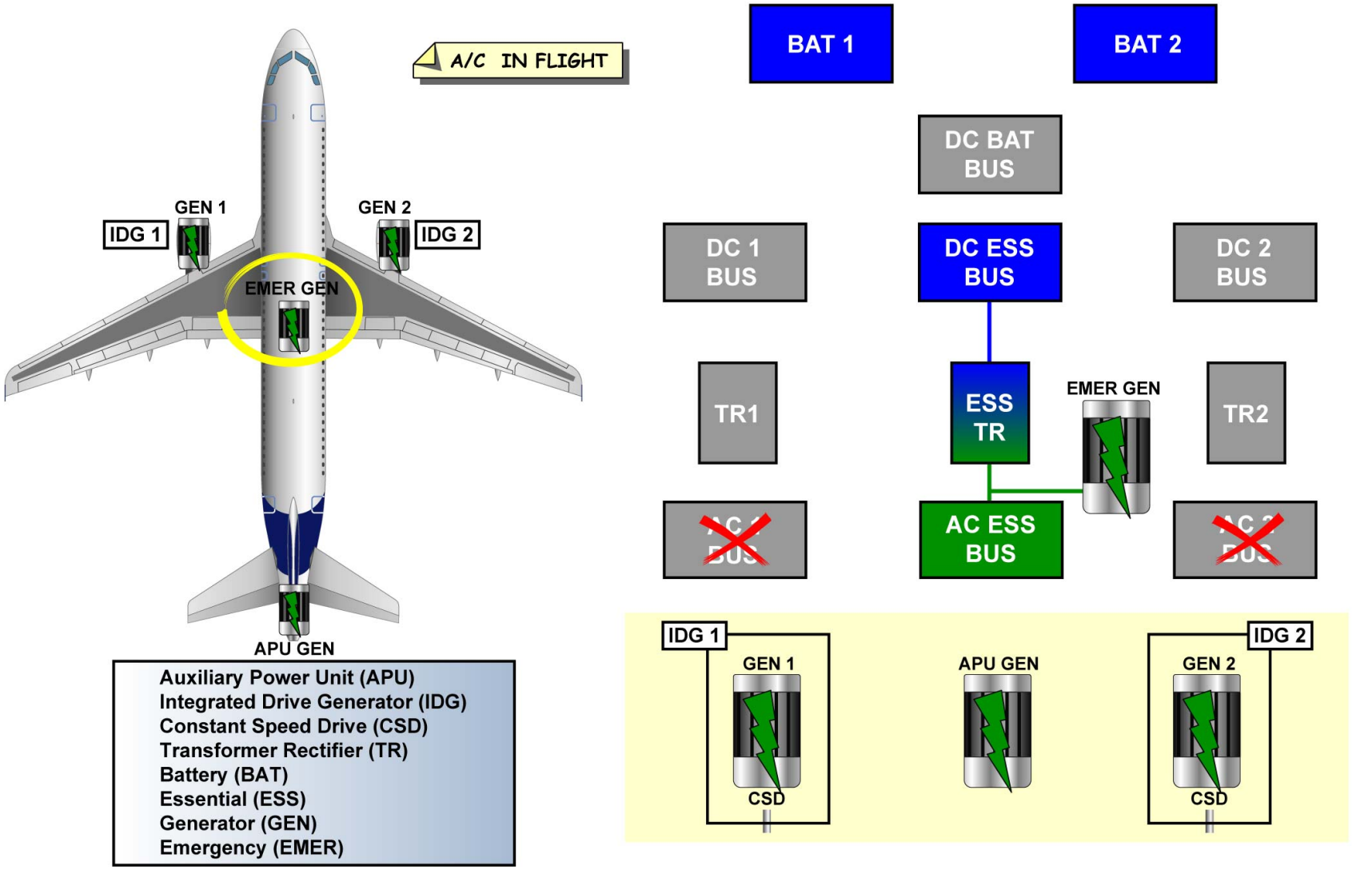

GENERAL - EMERGENCY CONFIGURATION

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

GENERAL (continued)

BATTERY ONLY CONFIGURATION

In emergency configuration with emergency generator not available, BAT 1 supplies the AC ESS BUS via the static inverter and BAT 2 supplies the DC ESS BUS.

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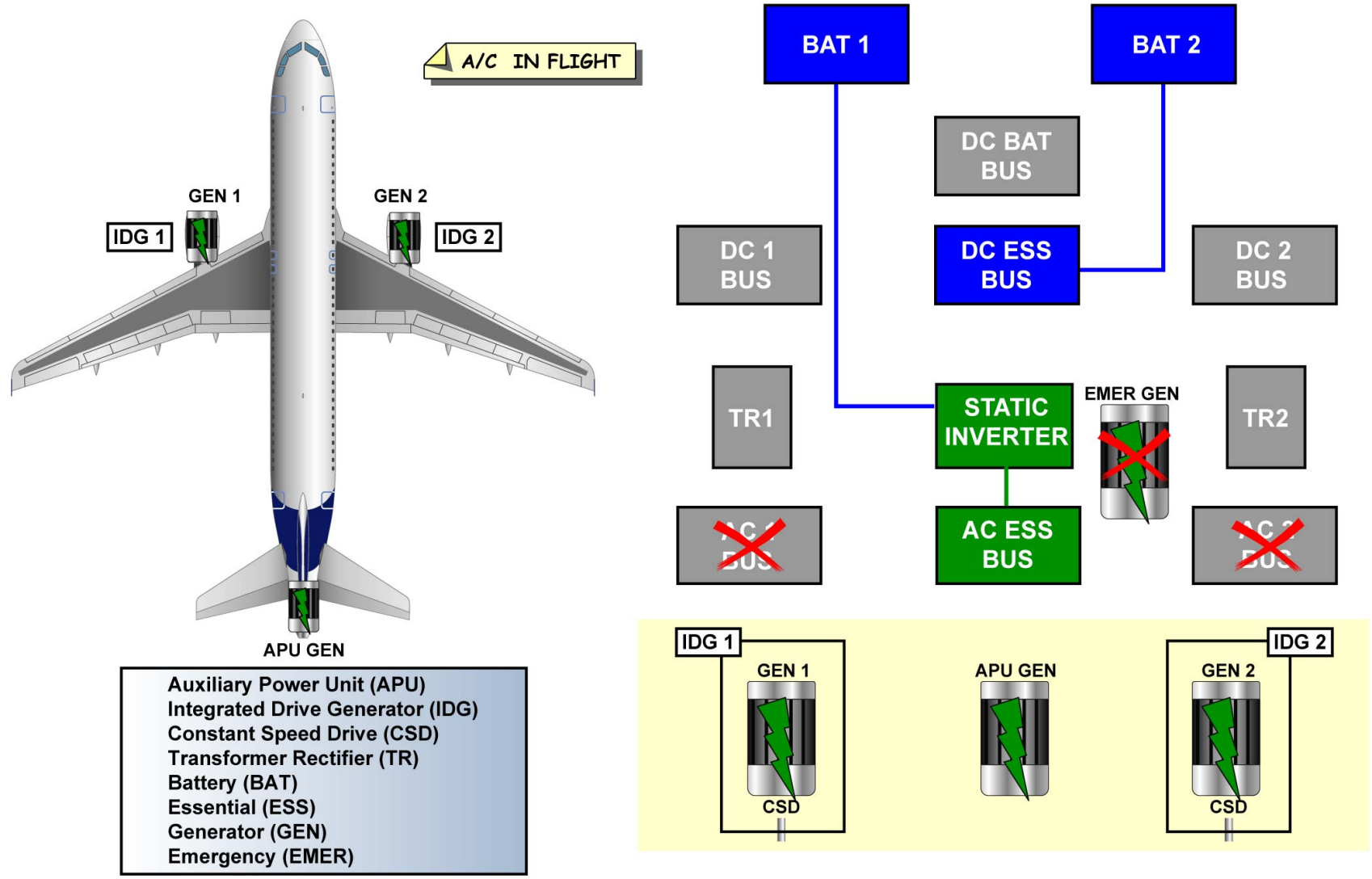


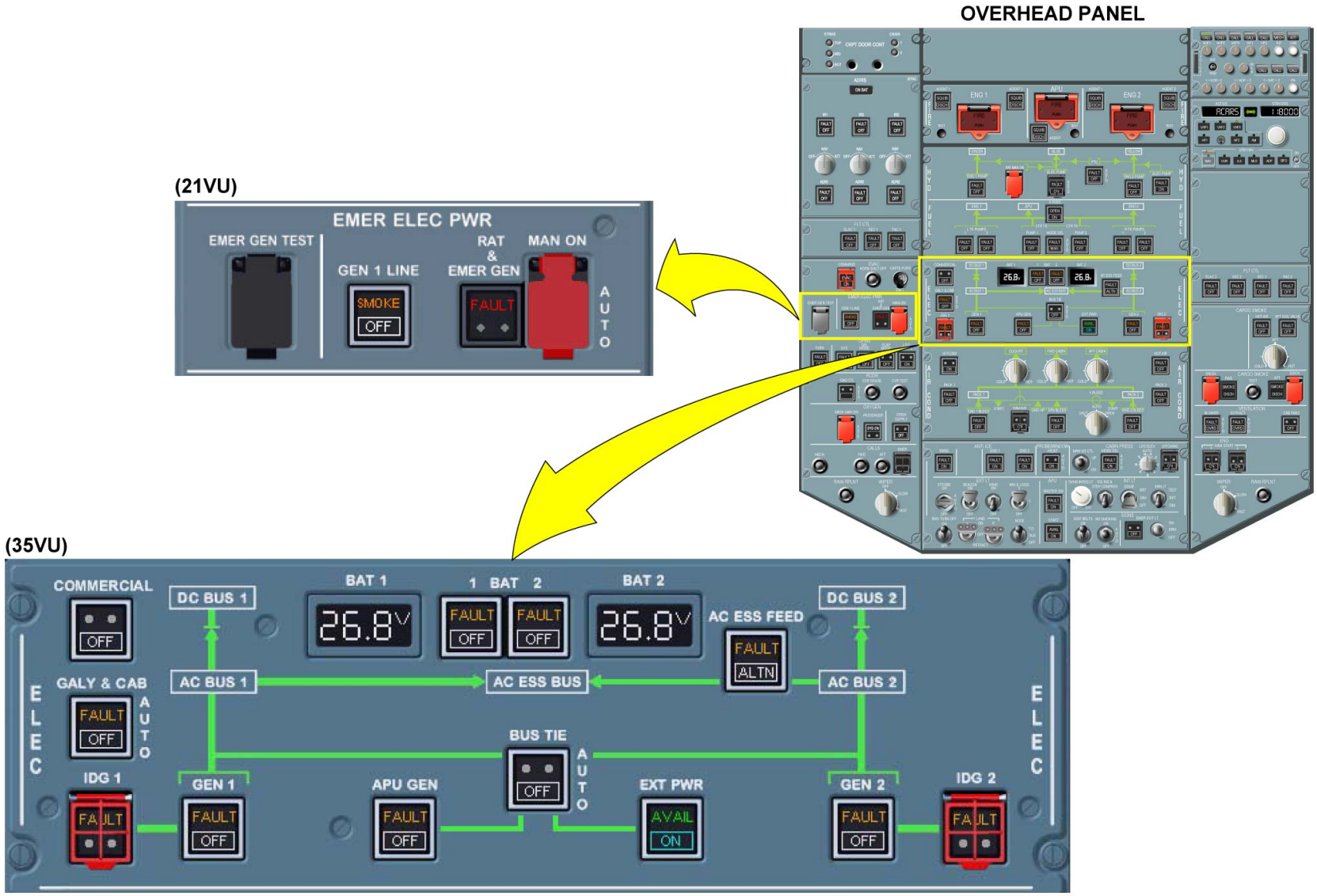
GENERAL - BATTERY ONLY CONFIGURATION

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

CONTROL AND INDICATING

For emergency cases, there is an EMER ELEC PWR panel

UGB13131 - U2AT4M0 - UM24PZ00000002



CONTROL AND INDICATING

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

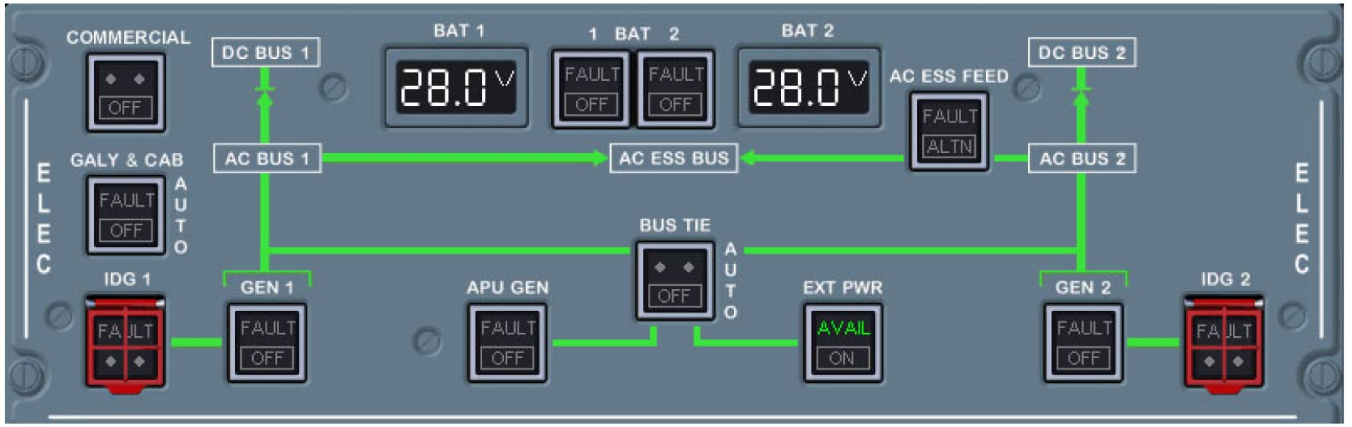
CONTROL AND INDICATING (continued)

MAIN PANEL/ECAM PAGE

The ECAM Electric System page shows all relevant data with regard to the entire A/C Electrical Power Generation and Distribution systems. The System page shown here is a normal configuration with main generators supplying the network.
The battery voltage can be monitored either on the overhead panel or the ECAM page. Each battery is controlled by a pushbutton switch (P/BSW).
Their related P/BSW control both main generators and the APU generator.
A P/BSW also controls the external power.
The AC ESS FEED P/BSW lets the pilots change the supply to the AC ESS bus from AC bus 1 to AC bus 2.
When the BUS TIE P/BSW is in the AUTO position, it lets the opening or closing of the bus tie contactors (not shown on the ECAM page) in order to supply the AC 1 and AC 2 buses according to the power supply priorities.
When OFF, both bus tie contactors open to isolate one side of the network from the other.
In case of failure, the IDG P/BSWitches disconnect the IDG from the engine gearbox.
The GALY & CAB P/BSW lets galleys and some sub-buses be manually shed.
The COMMERCIAL P/BSW is used for the shedding of all commercial loads including the GALY & CAB related buses.

UGB13131 - U2AT4M0 - UM24PZ00000002

(35VU)



SD

CONTROL AND INDICATING - MAIN PANEL/ECAM PAGE

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

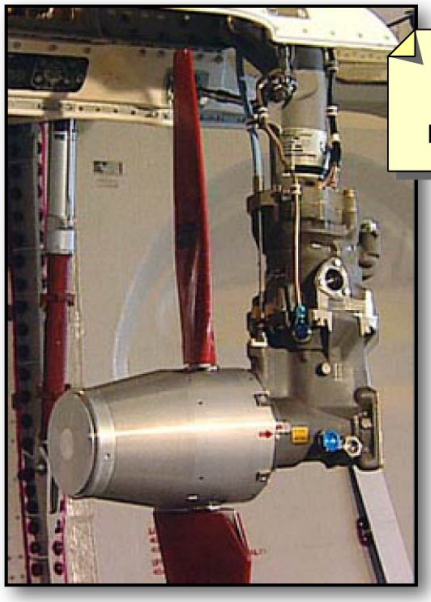
EMERGENCY PANEL

The EMER GEN TEST P/B is used on ground to test the EMERgency GENerator or the Static Inverter.
In avionics smoke condition, the GEN 1 LINE P/B disconnects the generator 1 from the bus-bar but the generator remains excited to supply some fuel pumps.
When AC BUS 1 and 2 are no longer supplied, the RAT will extend automatically to pressurize the blue hydraulic system, which powers the EMER GEN, if the A/C speed is sufficient.
Manual activation is also possible in case of automatic activation failure.

WARNING: ACTIVATION OF THE RED GUARDED MAN ON PUSHBUTTON ON THE GROUND OR IN FLIGHT WILL EXTEND THE RAM AIR TURBINE (RAT), EVEN ON COLD AIRCRAFT.

UGB13131 - U2AT4M0 - UM24PZ00000002

(21VU)



Ram Air Turbine (RAT)

Ram Air Turbine (RAT) DEPLOYMENT
+
EMERGENCY GENERATOR ACTIVATION

WARNING

ACTIVATION OF THE RED GUARDED MAN ON PUSHBUTTON ON THE GROUND OR IN FLIGHT WILL EXTEND THE Ram Air Turbine (RAT), EVEN ON COLD AIRCRAFT

CONTROL AND INDICATING - EMERGENCY PANEL

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

COMPONENT LAYOUT

The AC generators supply a 115 VAC, 3-phase, 400 Hz AC supply. The IDGs and the APU have a nominal 90 kVA power whereas the EMER GEN has a 5 kVA output.
The static inverter converts the direct current from battery 1 into an AC current if no other source is available.
The Battery Charge Limiters (BCLs) control the battery coupling and uncoupling to the DC BATTERY BUS to ensure battery charging and protection. Each battery is rated at 24 V with a capacity of 23 Ah. All TRs are identical and interchangeable.
In the Electrical Power Generation System (EPGS), the GAPCU controls the APU GEN and the external power. The Generator Control Units (GCUs) protect and control the A/C network and generators. GCUs and GAPCU supply AC electrical power parameters to show them on the ECAM display. The main C/B panels are located in the cockpit.
The ESS TR is identical to TR 1 and TR 2. It converts 115 VAC to 28 VDC at a rate of 200 A. The EMER GCU connects the EMER GEN to the ESS network, if all conditions are met.
On the Ground Power Control Panel there are 2 Lights which indicate the Ground Power Unit availability (AVAIL light) and the connection to the A/C network (NOT IN USE light). The Ground Power Unit should supply 3 phases 115VAC/400Hz rated at 90 KVA minimum.
The MAINTenance BUS SW lets the AC and DC service buses be supplied without energizing the whole A/C electrical network.
The aft cabin C/B panel contains only C/Bs.

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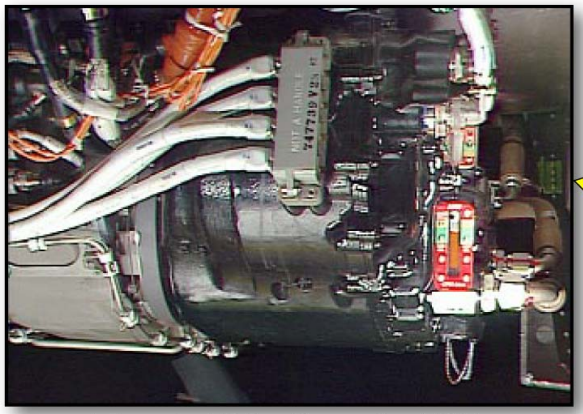
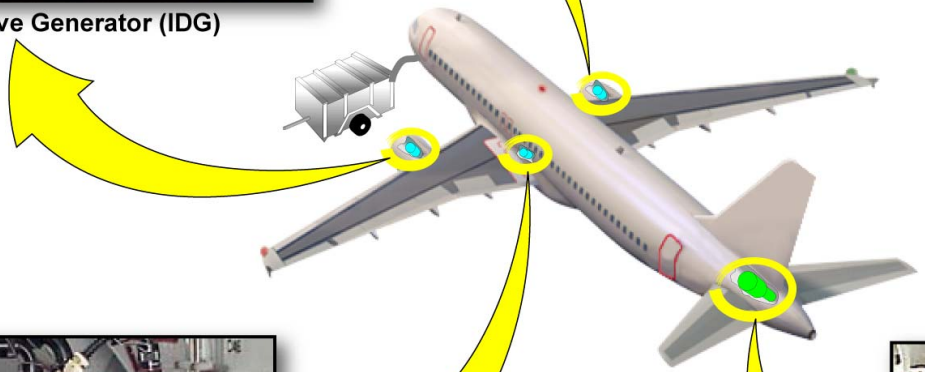
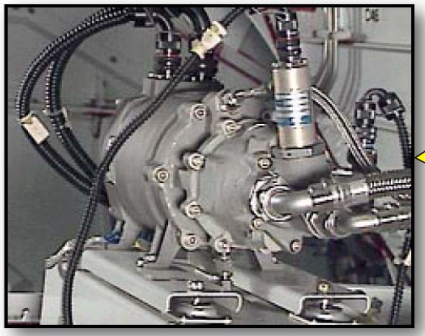


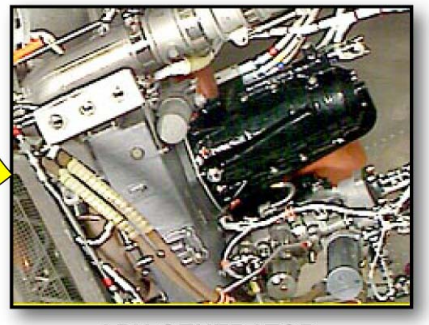
Integrated Drive Generator (IDG)

	VOLTAGE	FREQUENCY	PHASES	POWER
IDG 1/2	115 VAC	400 Hz	3 phases	90 kVA
APU GEN	115 VAC	400 Hz	3 phases	90 kVA
EMER GEN	115 VAC	400 Hz	3 phases	5 kVA





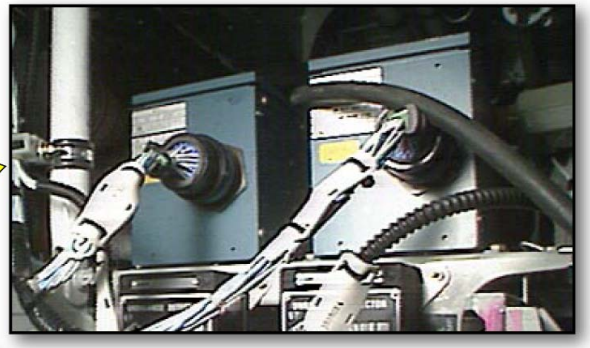
EMERGENCY GENERATOR



APU GENERATOR

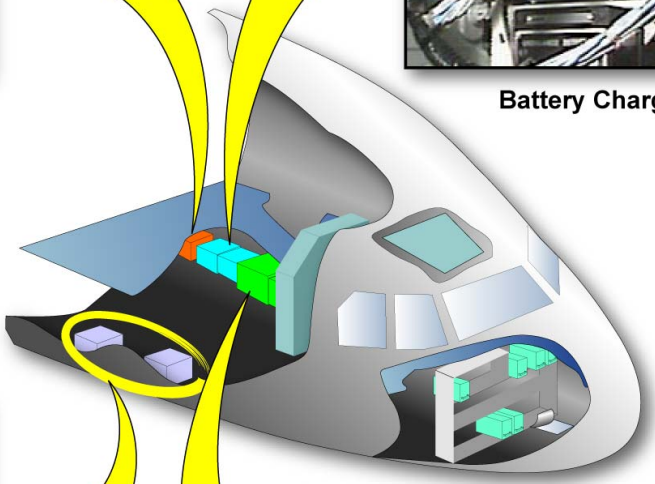
COMPONENT LAYOUT

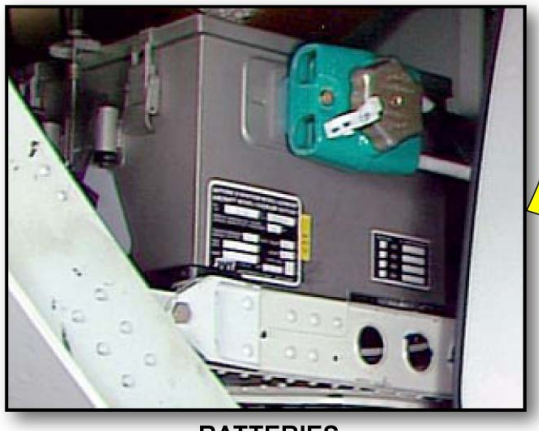
STATIC INVERTER



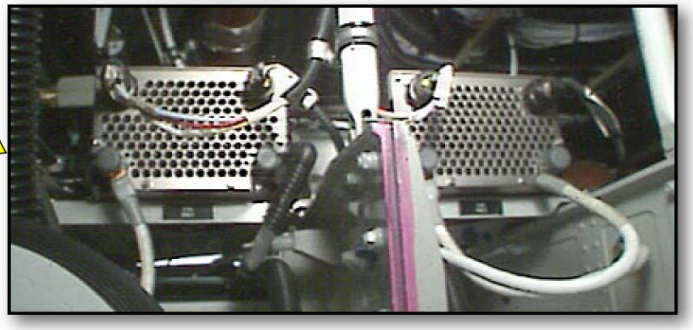
Battery Charge Limiters (BCLs)

	INPUT	OUTPUT	POWER
Static Inverter	24 VDC	115 VAC-400HZ (1 phase)	1 kVA
Transformer/ Rectifier (TR)	115 VAC	28 VDC	200 A



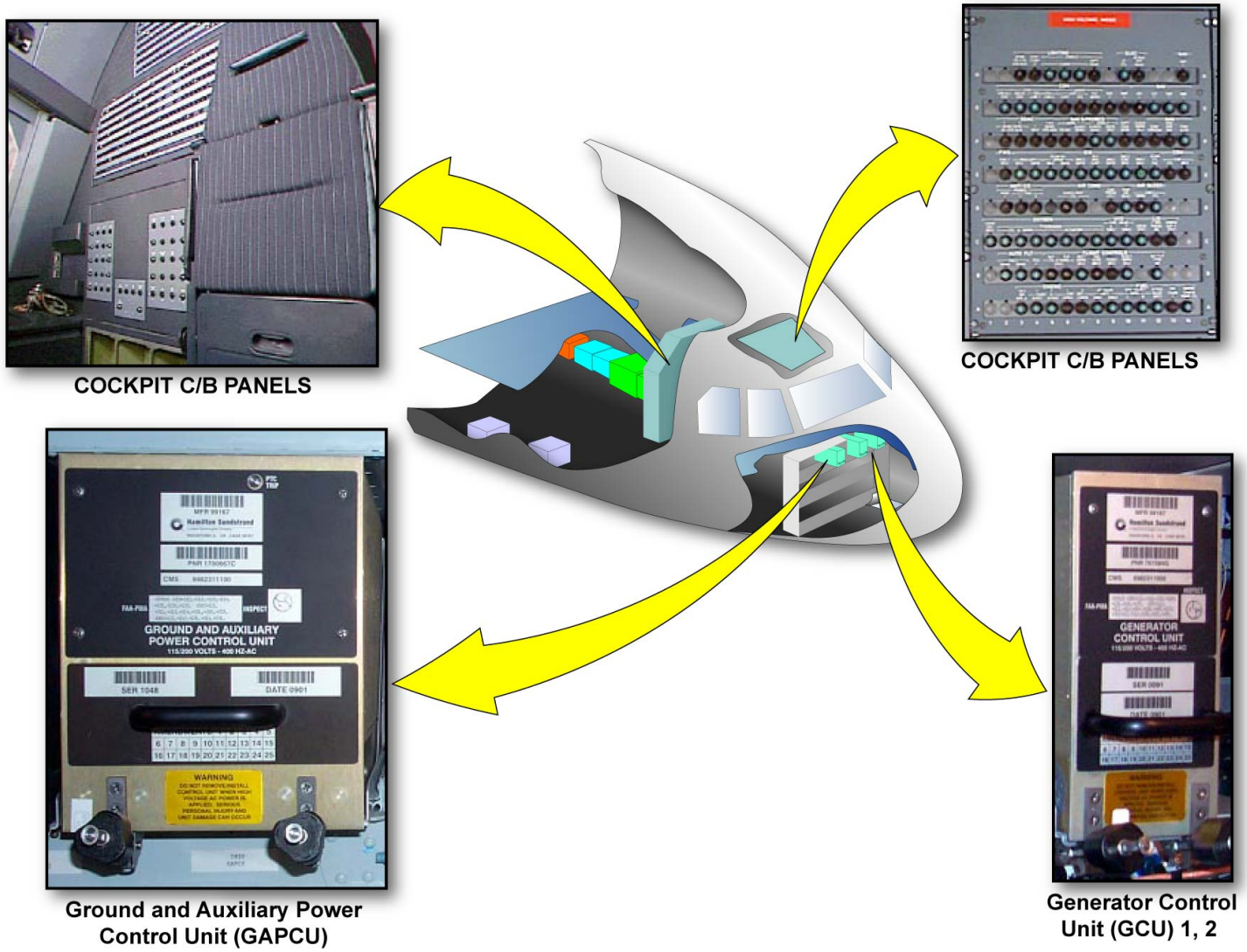


BATTERIES

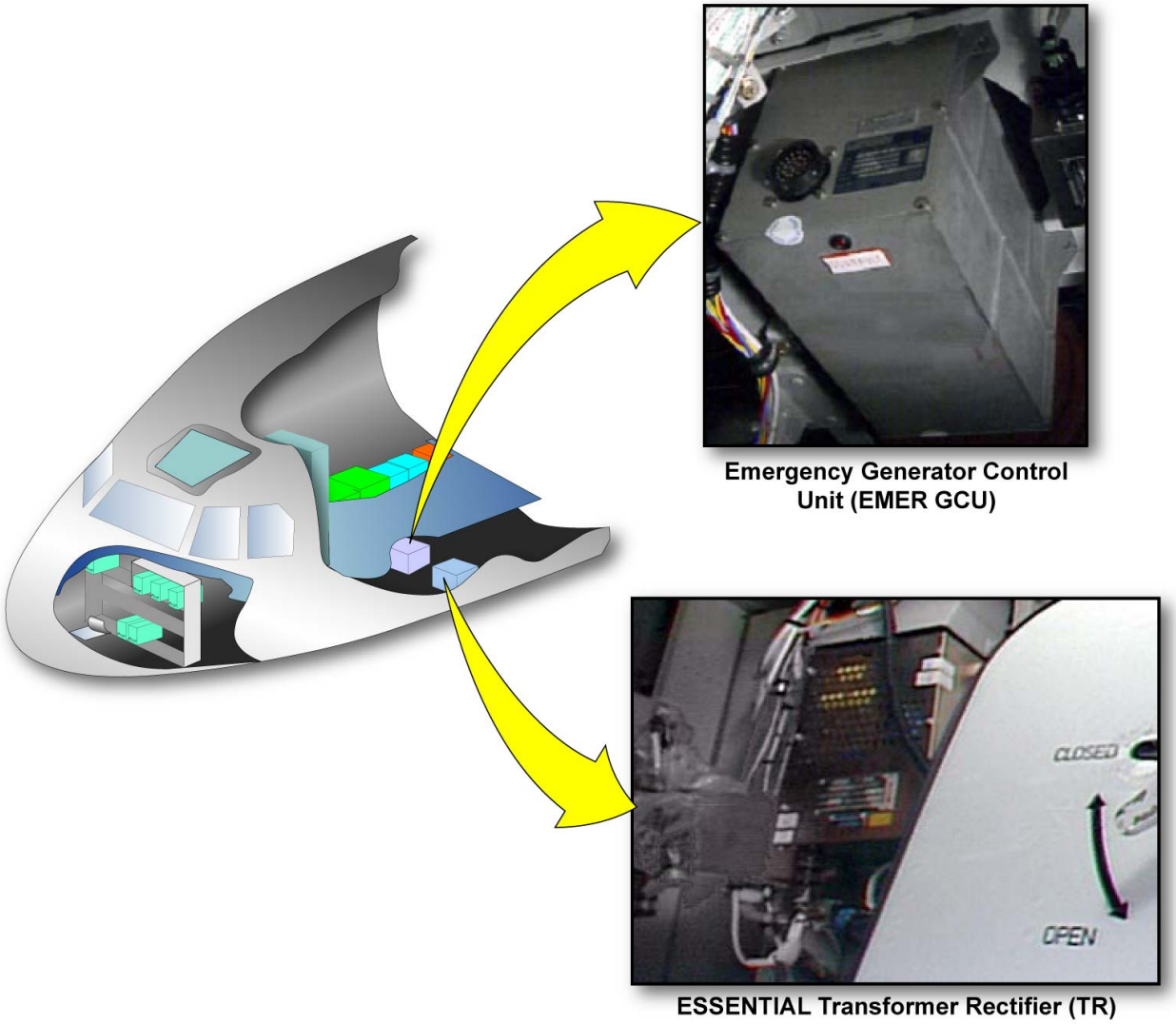


Transformer Rectifier (TR) 1, 2

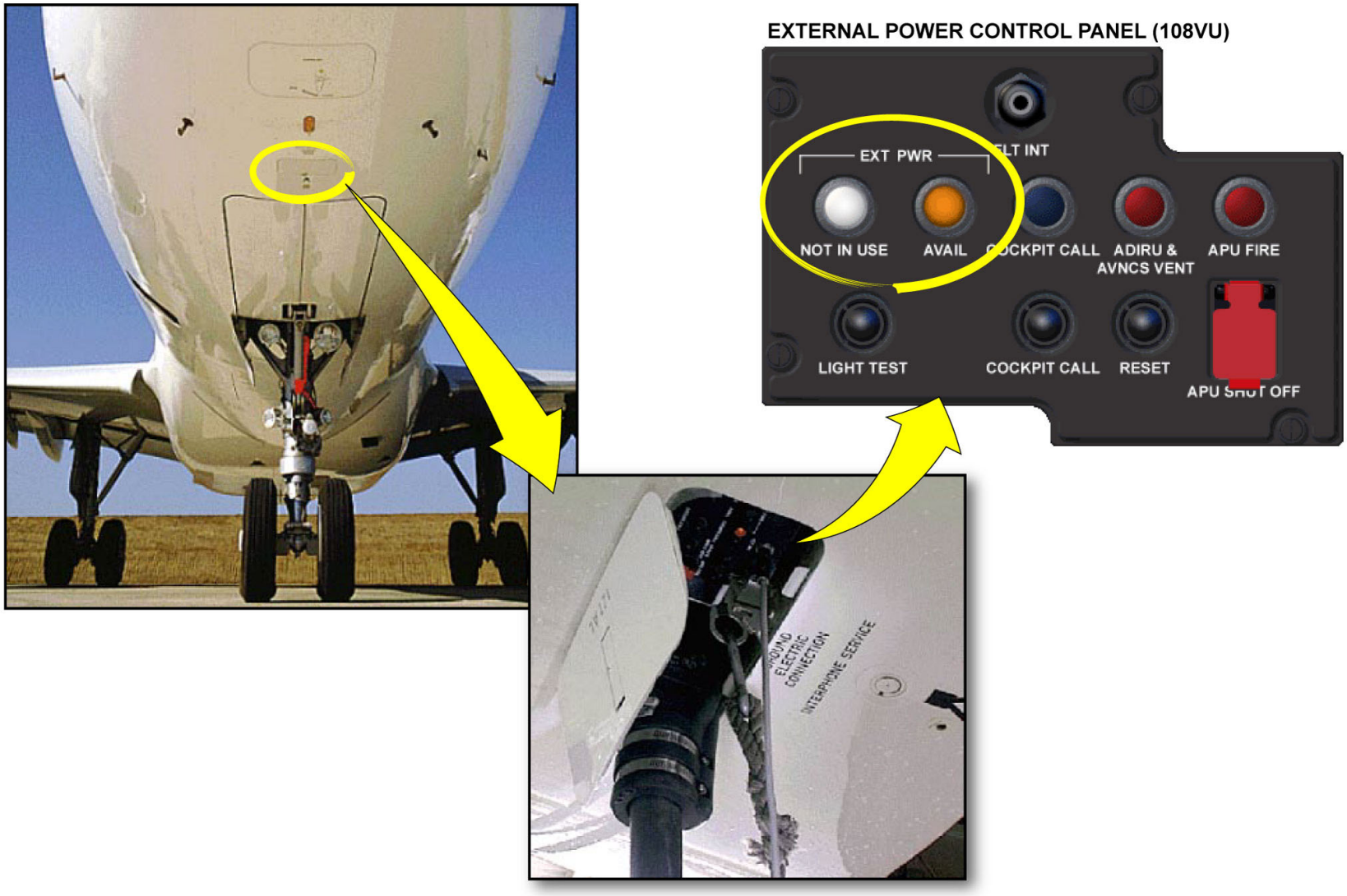
COMPONENT LAYOUT



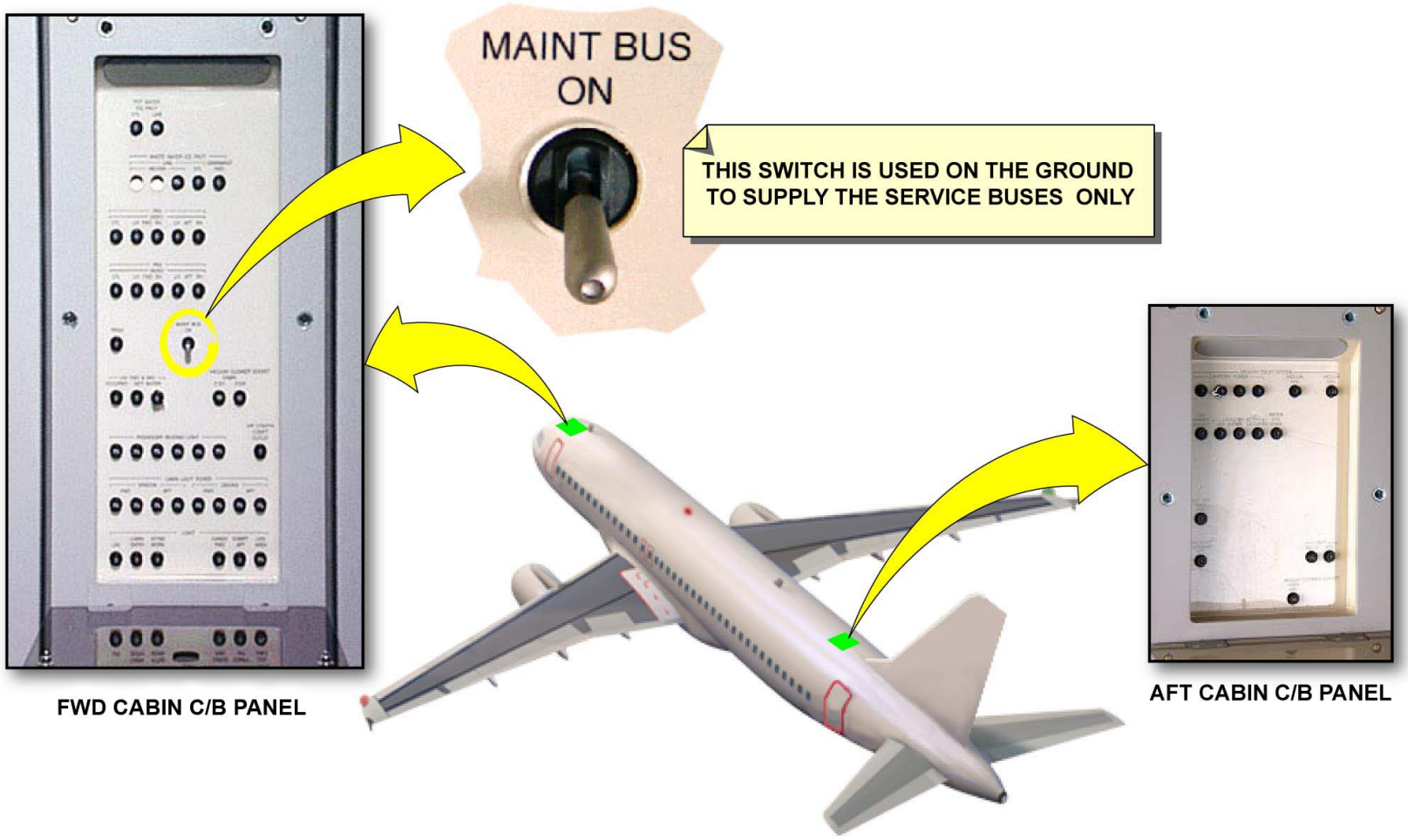
COMPONENT LAYOUT



COMPONENT LAYOUT



COMPONENT LAYOUT



COMPONENT LAYOUT

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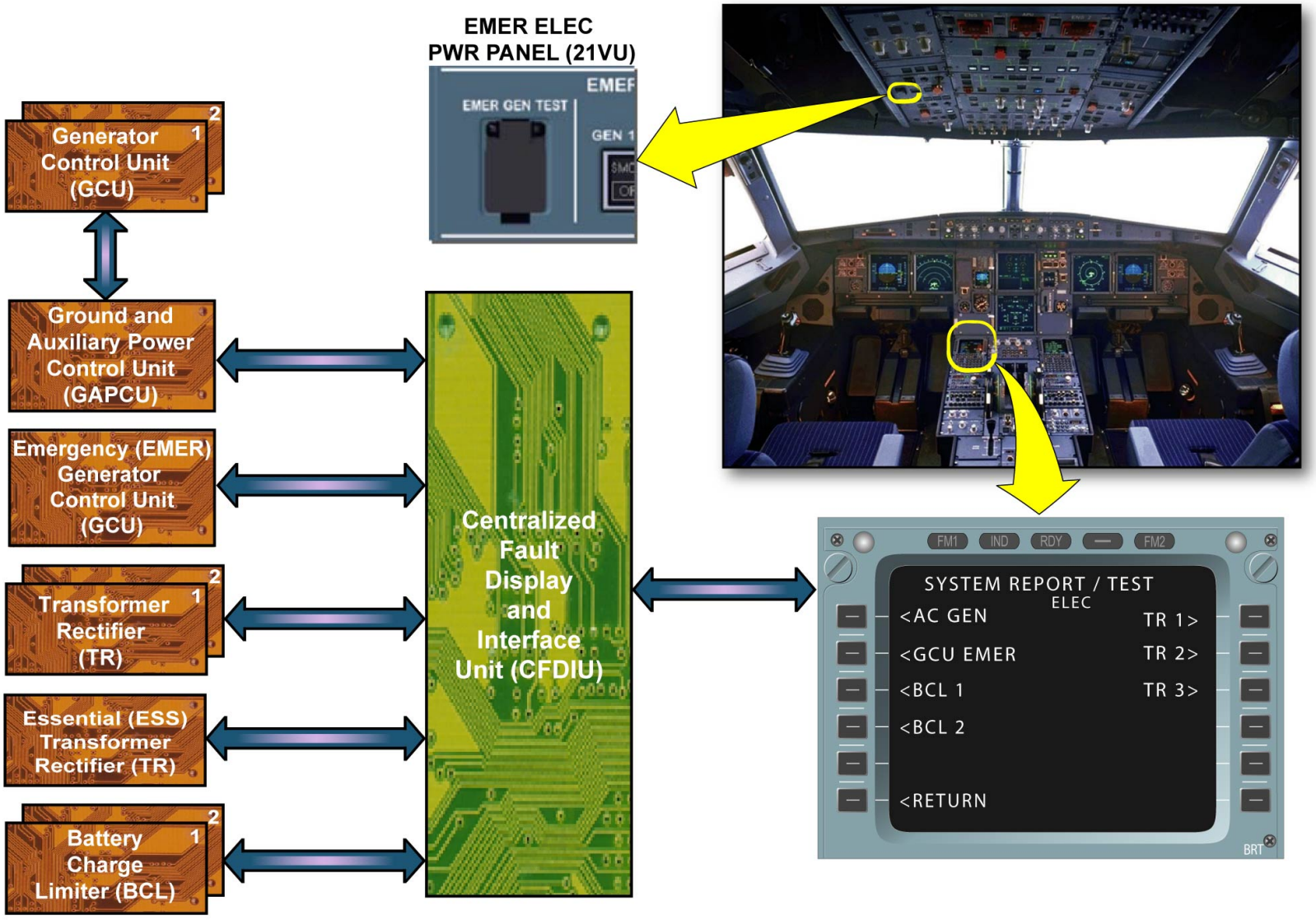
24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The GAPCU is the interface between the GCUs and the Centralized Fault Display Interface Unit (CFDIU) for test purposes and fault reporting on the MCDUs. Both the BCLs and the EMER GCU communicate with the CFDIU for the same purposes. The TRs are connected to the CFDIU so that they can be reset via the MCDU.



MAINTENANCE/TEST FACILITIES

24 ELECTRICAL POWER SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you do any maintenance task on the electrical system, make sure that no AC or DC power source is connected to the aircraft electrical circuits.
Before De-energizing aircraft electrics or before doing the Static Inverter test, tell all personnel on the aircraft that the lights will go out.
Some components are heavy. You must make sure that you can hold the component before its removal/installation. If it falls, it can cause injury to personnel and damage to the equipment.
Dangerous arcing can occur if external power (GPU or Gate power) is energized when trying to connect power to the aircraft. Make sure that external power source is de-energized before connecting.
Components can remain hot for one hour following engine shutdown. Be careful as hot parts and hot oil can cause injury and burn your eyes and skin. Use protective clothing, as oil products are poisonous.

ENVIRONMENTAL PRECAUTIONS

Turn-off unused ground service equipment (GPU, Air conditioning cart, etc...) if no work is being done or nobody is present on the aircraft.

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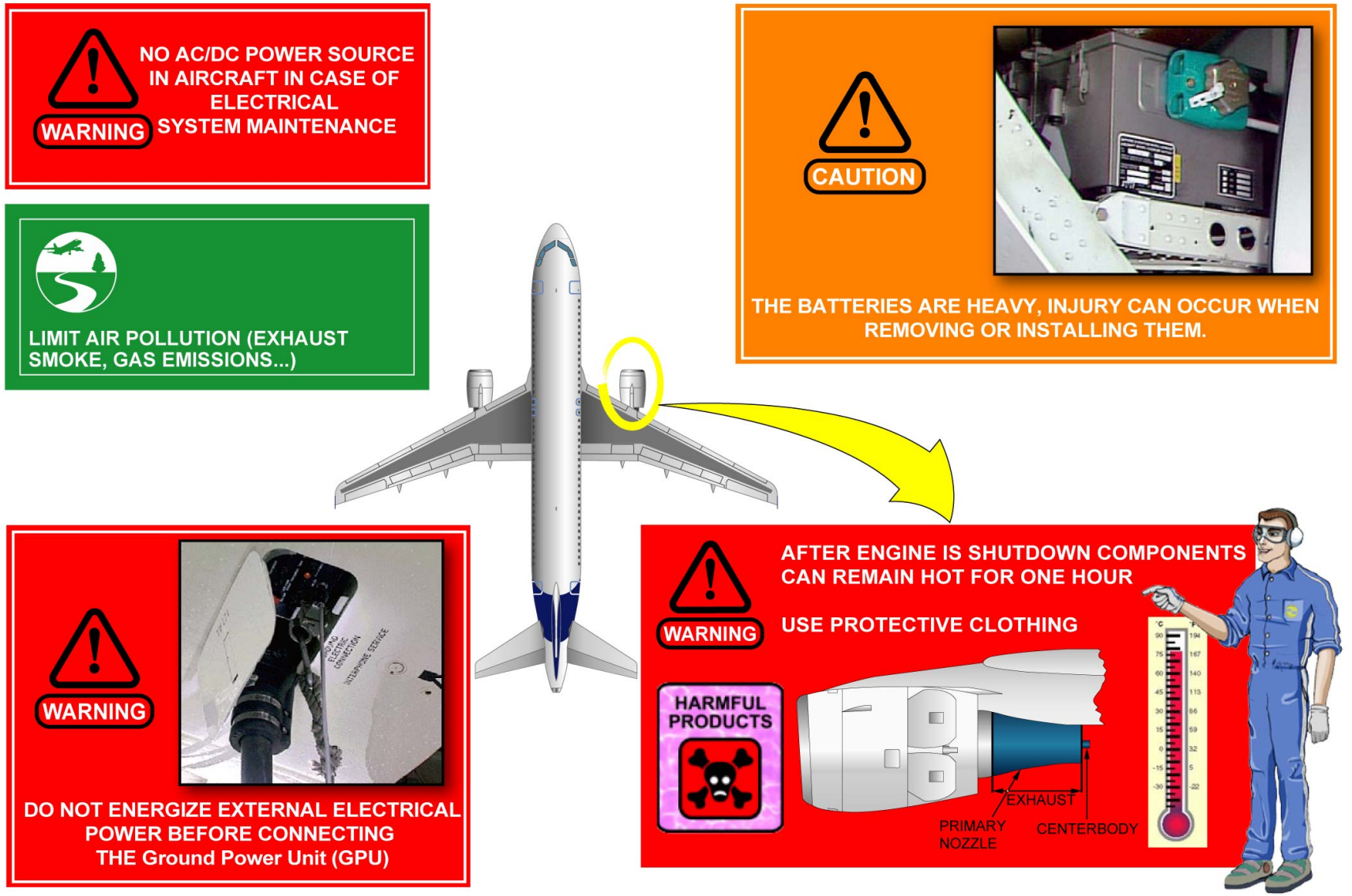
WARNING
NO AC/DC POWER SOURCE IN AIRCRAFT IN CASE OF ELECTRICAL SYSTEM MAINTENANCE
LIMIT AIR POLLUTION (EXHAUST SMOKE, GAS EMISSIONS...)
CAUTION
THE BATTERIES ARE HEAVY, INJURY CAN OCCUR WHEN REMOVING OR INSTALLING THEM.
WARNING
DO NOT ENERGIZE EXTERNAL ELECTRICAL POWER BEFORE CONNECTING THE Ground Power Unit (GPU)
WARNING
AFTER ENGINE IS SHUTDOWN COMPONENTS CAN REMAIN HOT FOR ONE HOUR
USE PROTECTIVE CLOTHING
HARMFUL PRODUCTS
EXHAUST
PRIMARY NOZZLE
CENTERBODY

SAFETY PRECAUTIONS - ENVIRONMENTAL PRECAUTIONS

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

GENERAL SYSTEM

The Airbus Single Aisle aircraft family includes several different types of navigation systems, each used for particular functions. The systems will be explained in separate groups based on their functions. These functions are broken down into 4 main groups. They will be presented in separate modules:
- Air Data/Inertial Reference System (ADIRS) and standby instruments,
- Dependent position determining systems,
- Landing aids,
- Independent position determining systems.

There are several subsystems within each group.
The first group includes:
- Air Data Inertial Reference Units (ADIRUs),
- Standby Instruments,
- Digital Distance and Radio Magnetic Indicator (DDRMI) (optionally removed for Thalès equipment only),
- Integrated Standby Instrument System (ISIS).

The second group (dependent position determining systems) includes:
- GPS,
- ATC/Traffic Alert and Collision Avoidance System (TCAS),
- DME,
- ADF,
- VOR.

The third group (landing aids) includes:
- ILS,
- Marker receivers.

The fourth group (independent position determining systems) includes:
- Enhanced Ground Proximity Warning System (EGPWS),
- RAs,
- Weather Radar (WXR) and Predictive Windshear (PWS).

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Air Data/Inertial Reference System (ADIRS) & STANDBY INSTRUMENTS

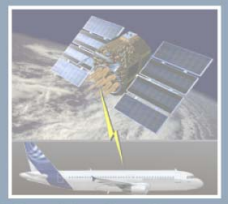
ADIRS & Digital Distance and Radio Magnetic Indicator (DDRMI)

STANDBY INSTRUMENTS

STANDBY INSTRUMENTS

OPTION

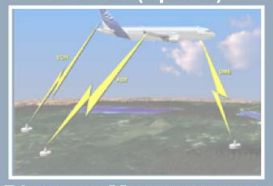
DEPENDENT POSITION DETERMINING SYSTEMS



Global Positioning System (GPS)

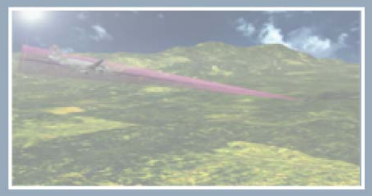
Air Traffic Control (ATC)

Traffic Collision Avoidance System (TCAS) / T2CAS (option)

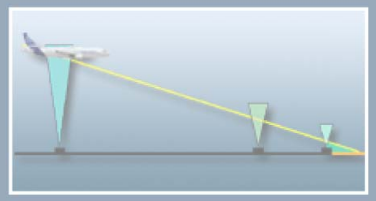


Distance Measurement Equipment (DME)
Automatic Direction Finder (ADF)
VHF Omnidirectional Range (VOR)

LANDING AIDS



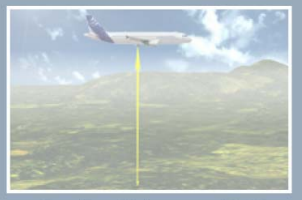
Instrument Landing System (ILS)



MARKER

INDEPENDENT POSITION DETERMINING SYSTEMS

Enhanced Ground Proximity Warning System (EGPWS) / T2CAS (option)



Radio Altimeter (RA)

Weather Radar (WXR) & Predictive Windshear (PWS)

T2CAS: Traffic and Terrain Collision Avoidance System

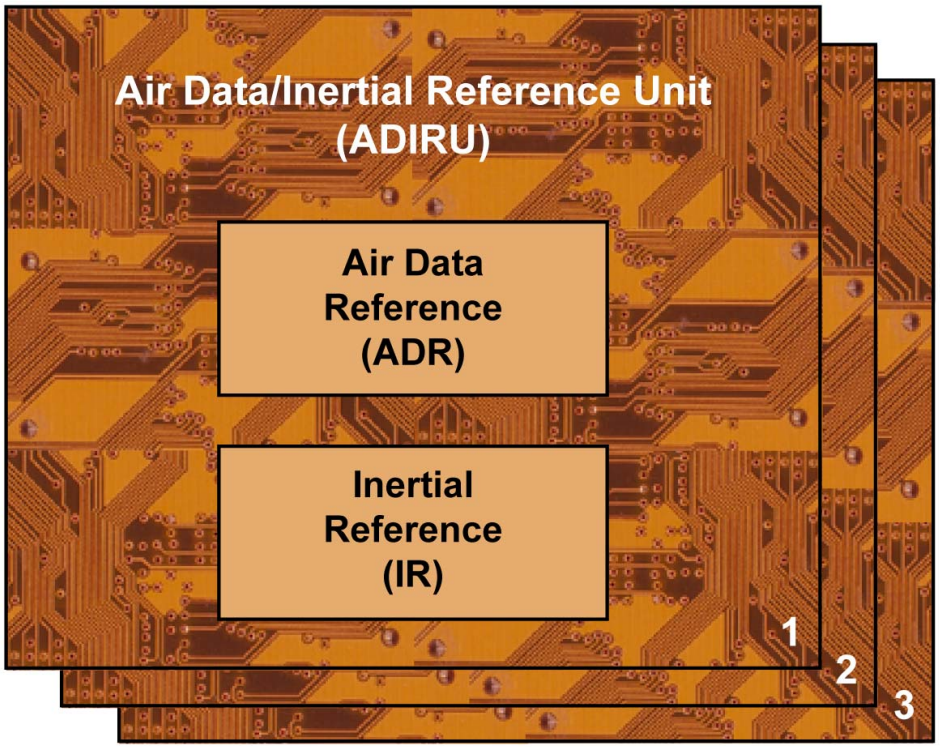
GENERAL SYSTEM

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM

The aircraft has three identical and interchangeable ADIRUs.
Each ADIRU combines computers that carry out two functions in a single unit with a shared power supply. Those computers are:
- An Air Data Reference (ADR) unit,
- A strapdown Inertial Reference (IR) unit, using laser gyros and accelerometers.

The ADR and IR systems of each ADIRU operate independently, and a failure of one system does not affect the other one.



AIR DATA/INERTIAL REFERENCE SYSTEM

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM (continued)

AIR DATA INPUTS

The ADIRS systems have peripheral components connected to the LRUs. These components are an integral part of the Air Data portion.
The components are:
- Pitot probes,
- Static ports,
- Angle of Attack Sensors (AOA),
- Total Air Temperature Sensor (TAT).

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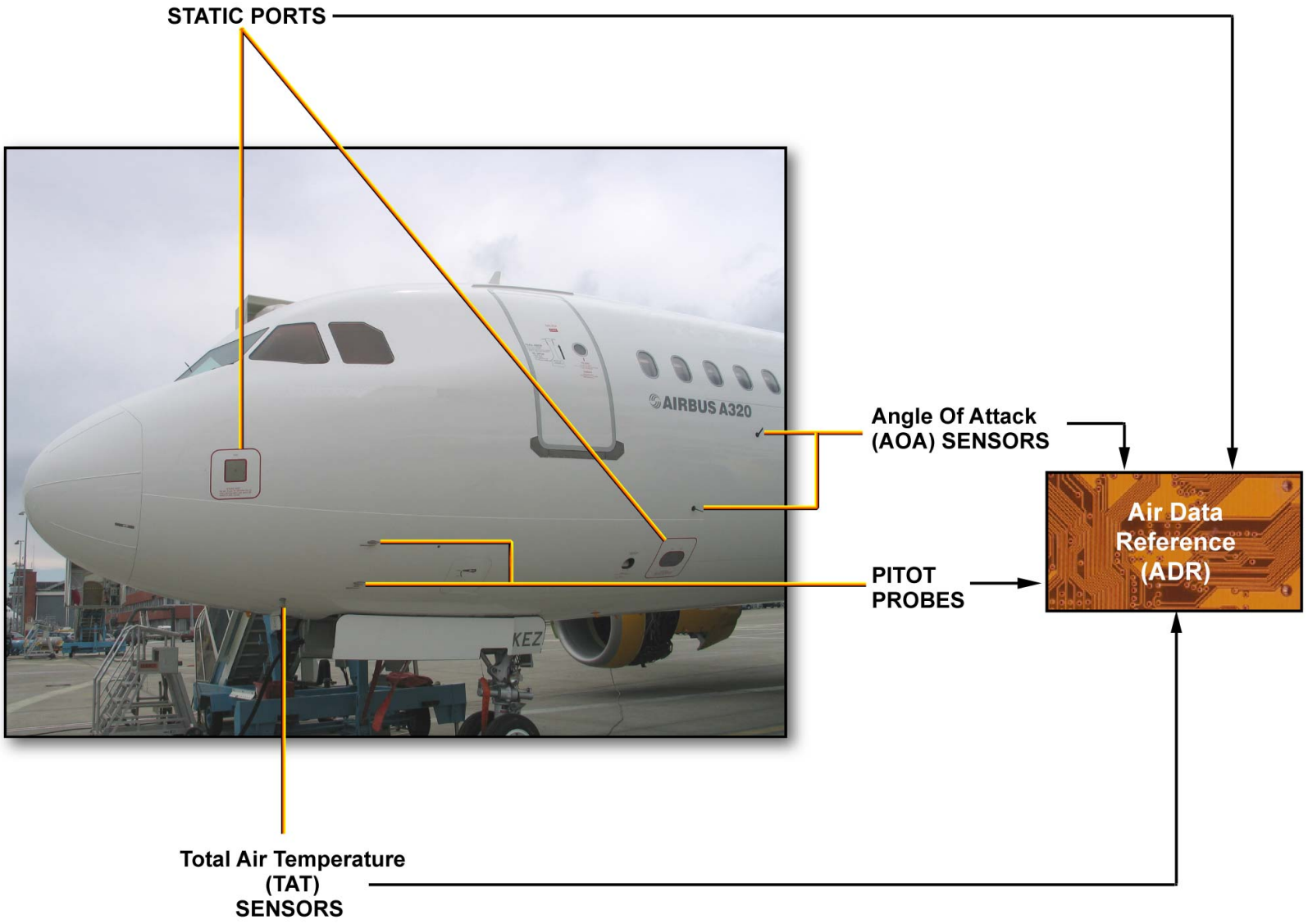

AIR DATA/INERTIAL REFERENCE SYSTEM - AIR DATA INPUTS

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM (continued)

AIR DATA SECTION

The ADR part supplies various air data parameters to the EFIS instruments and other users:
- Airspeed, mach number, barometric altitude to the PFD and overspeed to the Flight Warning Computer (FWC),
- TAT, Static Air Temperature (SAT) and AOA to other indicators and users.

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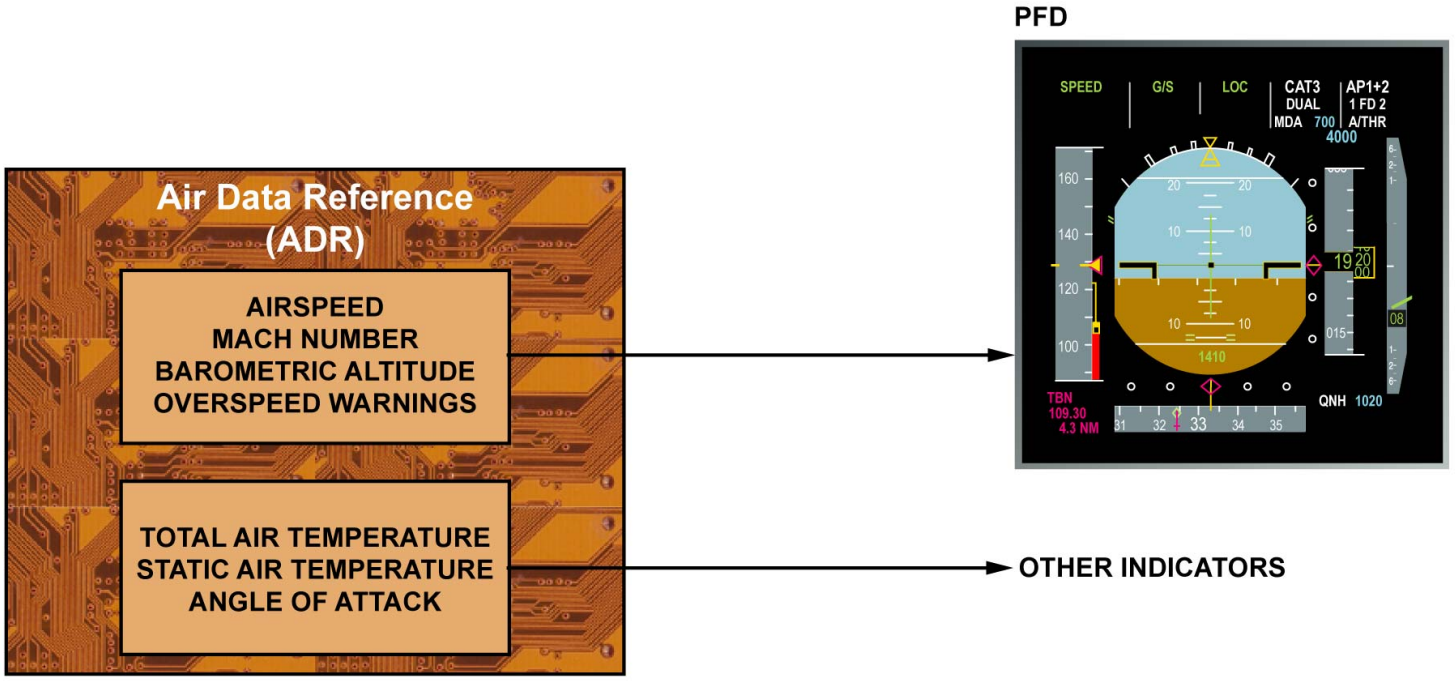

AIR DATA/INERTIAL REFERENCE SYSTEM - AIR DATA SECTION

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM (continued)

INERTIAL REFERENCE SECTION

The IR part of the ADIRU uses laser gyros and accelerometers. They give inertial data to the EFIS, Flight Management and Guidance Computers (FMGCs) and other users. Each ADIRU gives:
- Attitude, heading, Vertical Speed (V/S), flight path vector to the PFD,
- Heading, ground speed to the ND,
- IR position to FMGCs for A/C position computation. This data is available on the MCDU DATA page.

The Flight Management Guidance System (FMGS) uses the reference point coordinates of the departure airport to align the Inertial Reference System (IRS). It automatically gets these coordinates from the database when the operator enters a company route or an origin-destination city pair and pushes the ALIGN IRS key on the MCDU. The operator can manually adjust these coordinates to the gate position.

With the latest ADIRUs, an optional automatic alignment by GPS position is possible. No operator action is necessary for this initialization by GPS.

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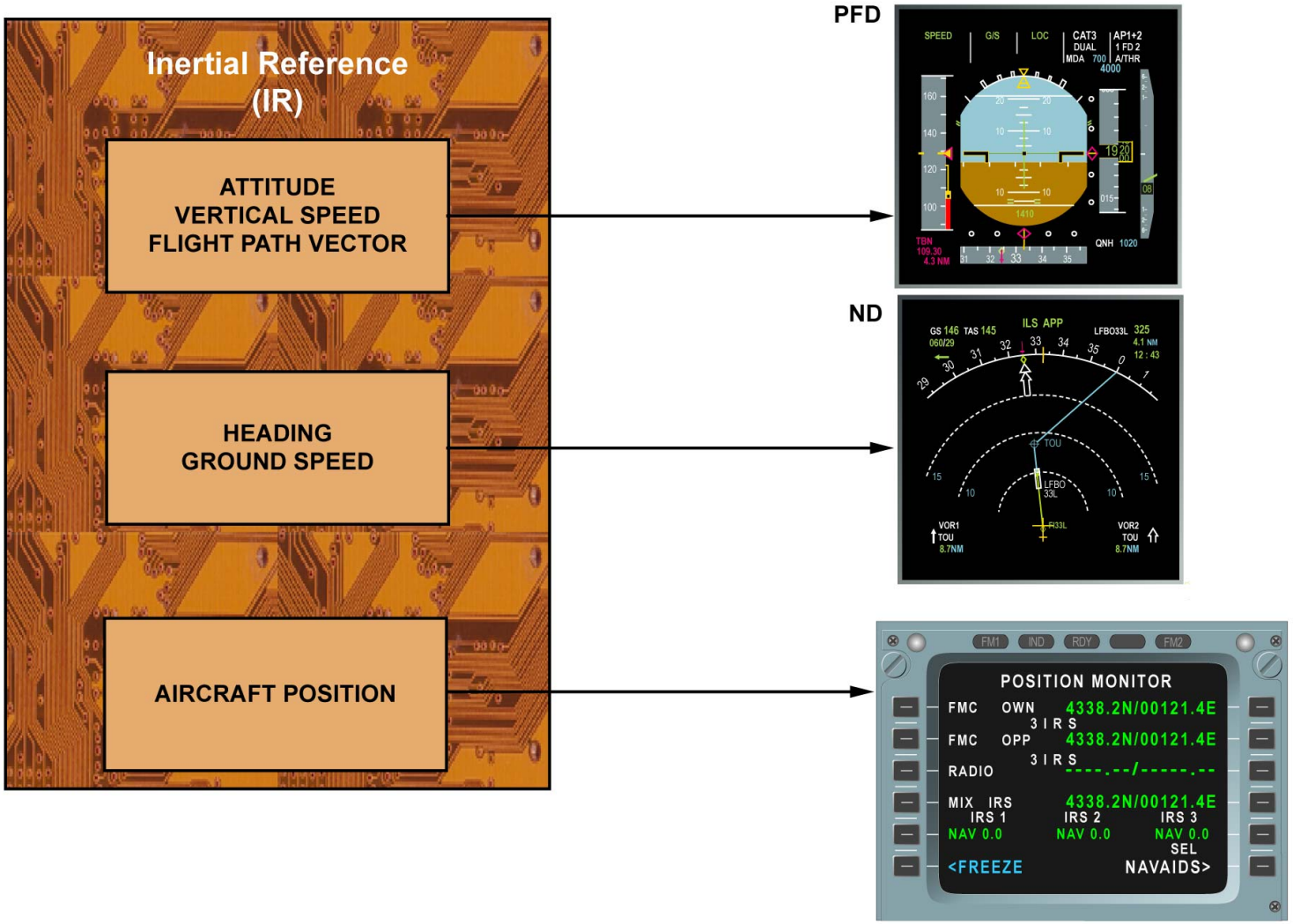

AIR DATA/INERTIAL REFERENCE SYSTEM - INERTIAL REFERENCE SECTION

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM (continued)

ADIRS CONTROL AND INDICATING

The three ADIRUs are controlled through the single ADIRS Mode Selector Unit (MSU) installed on the overhead panel.
The initialization of the ADIRUs is normally done through either one or the two MCDUs installed on the center pedestal.
The Digital Distance Radio Magnetic Indicator (DDRMI) is optionally installed on the main instrument panel below the standby instruments. It supplies digital DME distance information, as well as heading coming from ADIRS, and VOR/ADF bearing information.

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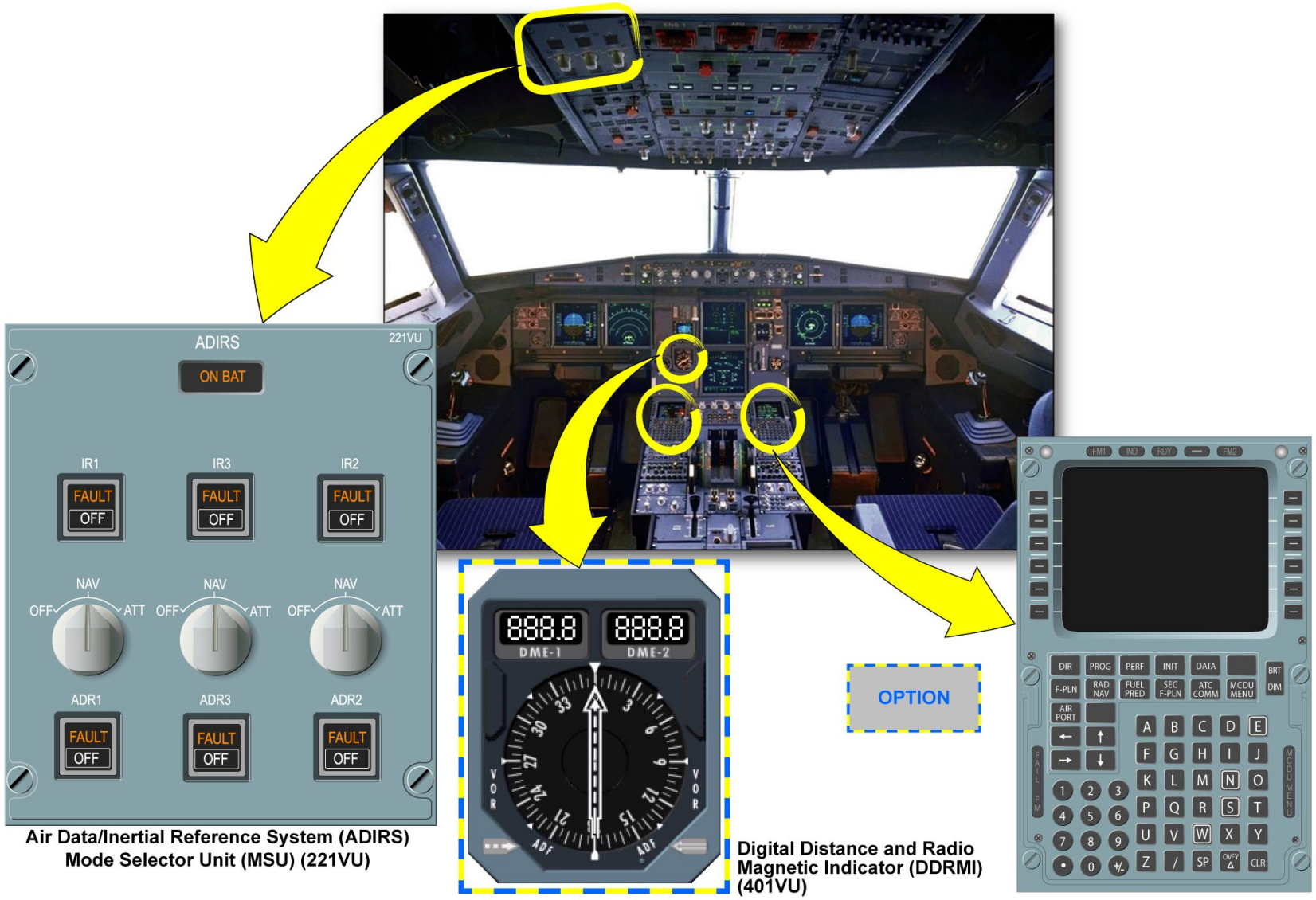

Air Data/Inertial Reference System (ADIRS) Mode Selector Unit (MSU) (221VU)

Digital Distance and Radio Magnetic Indicator (DDRMI) (401VU)

AIR DATA/INERTIAL REFERENCE SYSTEM - ADIRS CONTROL AND INDICATING

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

AIR DATA/INERTIAL REFERENCE SYSTEM (continued)

PFD AND ND INDICATING

ADIRU 1 supplies the CAPT PFD and ND, and ADIRU 2 supplies the F/O PFD and ND.
ADIRU 3 is used as a hot spare and can be switched via the switching panel to replace ADIRU 1 or ADIRU 2. Each part of the ADIRU (ADR or IR) can be independently switched.

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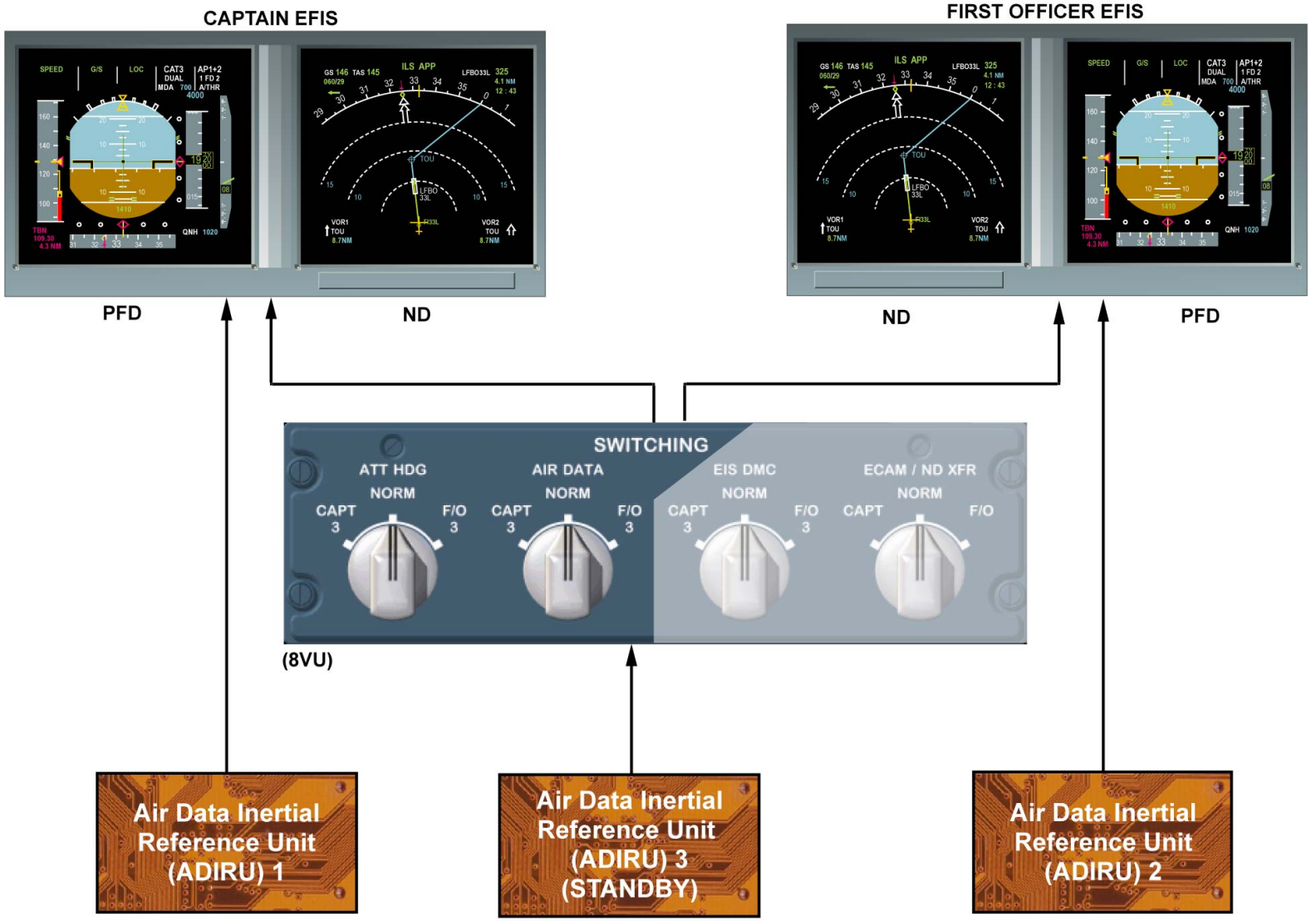


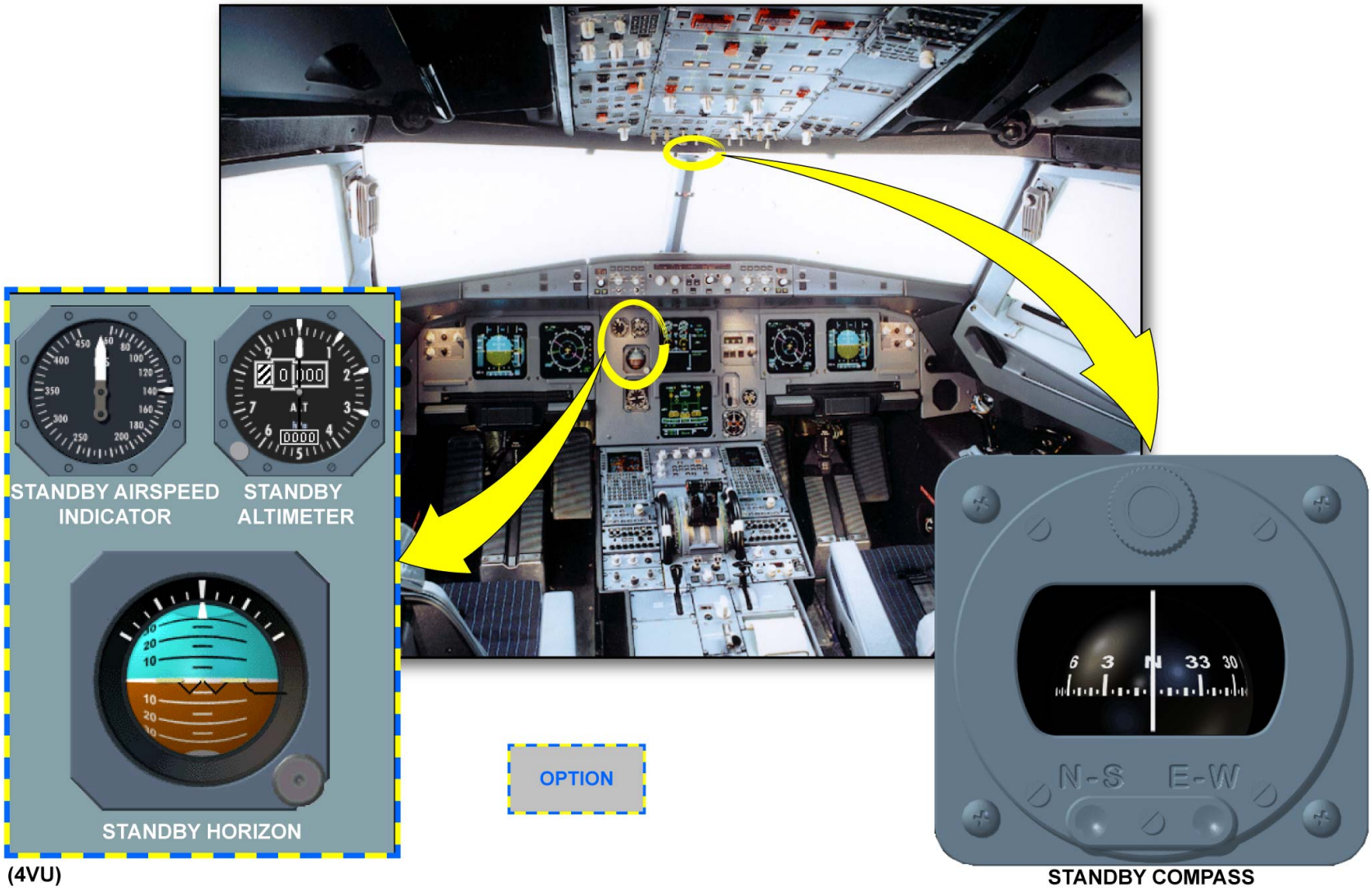
AIR DATA/INERTIAL REFERENCE SYSTEM - PFD AND ND INDICATING

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

STANDBY INSTRUMENTS (OPTIONAL)

If there is a failure of the EFIS system, the standby instruments can be used.
There are 3 conventional standby instruments, installed on the instrument panel:
- Airspeed indicator,
- Altimeter,
- Horizon.

The standby compass is installed immediately below the overhead panel.



STANDBY INSTRUMENTS (OPTIONAL)

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

INTEGRATED STANDBY INSTRUMENT SYSTEM

The enhanced standby instrument, called Integrated Standby Instrument System (ISIS), is installed on the instrument panel near the ECAM. It replaces the 3 conventional standby instruments. The inputs to the airspeed indication and the altimeter come directly from the air sources (standby pitot probe and static ports). The standby horizon is self-contained. ISIS can also display heading and ILS data. The standby compass is installed immediately below the overhead panel.

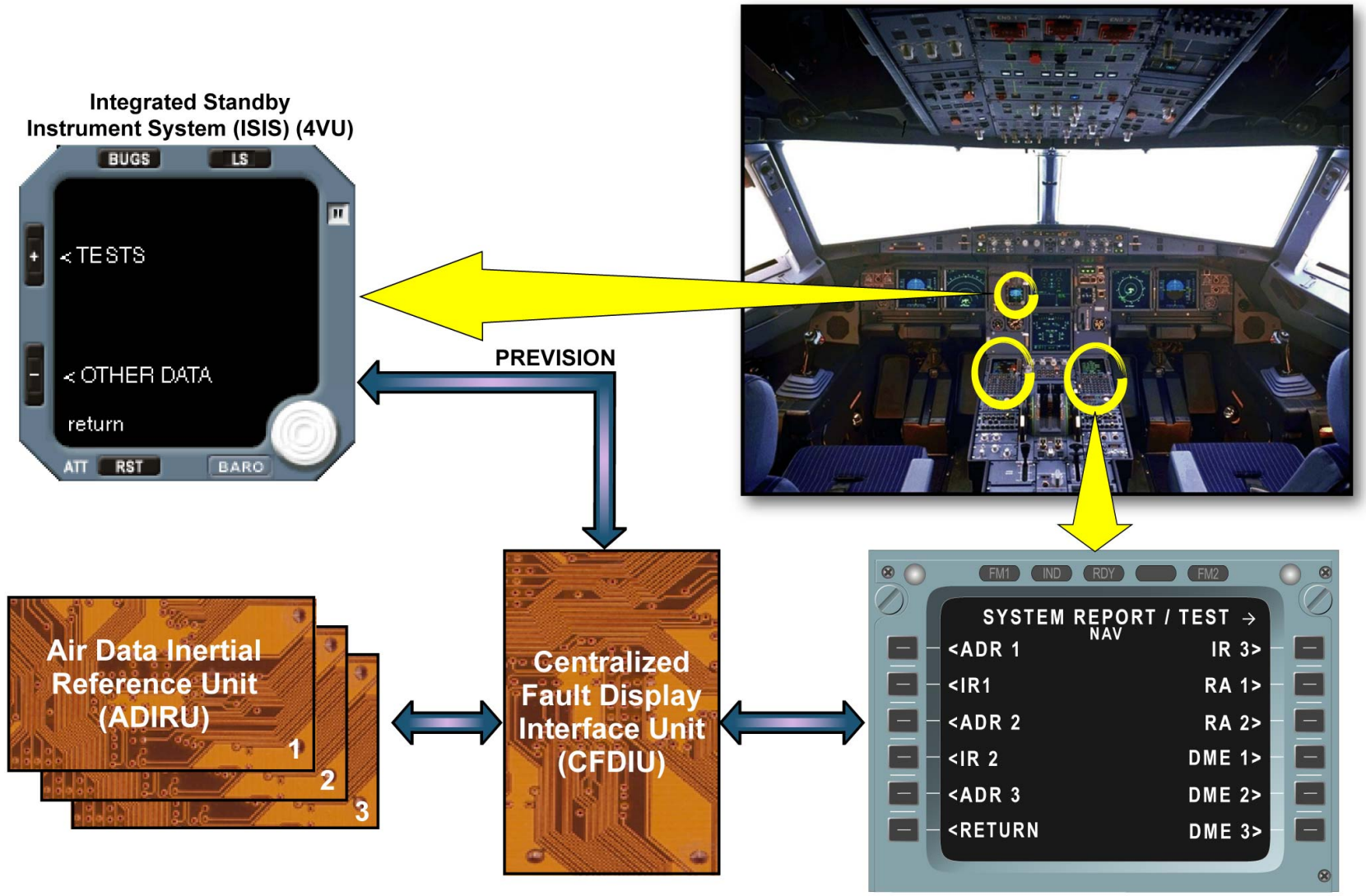
INTEGRATED STANDBY INSTRUMENT SYSTEM

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

All the navigation systems can be tested from the MCDUs except the ISIS.
ISIS tests and OTHER DATA are accomplished directly from the unit itself.

UGB13131 - U2AT4M0 - UM34PZ00000002



MAINTENANCE/TEST FACILITIES

34 ADIRS AND STBY INSTRUMENTS PRESENTATION (1)

SAFETY PRECAUTIONS

When you do work on the A/C, make sure that you obey all the Aircraft Maintenance Manual (AMM) procedures. This will prevent injury to persons and/or damage to the A/C.
Before you do the test of the probes, remove the protective covers. Do not continue the test for more than one minute to prevent damage.
Do not touch the probes immediately after the test, they are hot.

UGB13131 - U2AT4M0 - UM34PZ00000002

CAUTION

BEFORE TESTING PROBES, REMOVE COVERS.
DO NOT CONTINUE THE TEST FOR MORE THAN 1 MINUTE.

WARNING

OBEY ALL THE AMM SAFETY PROCEDURES

WARNING

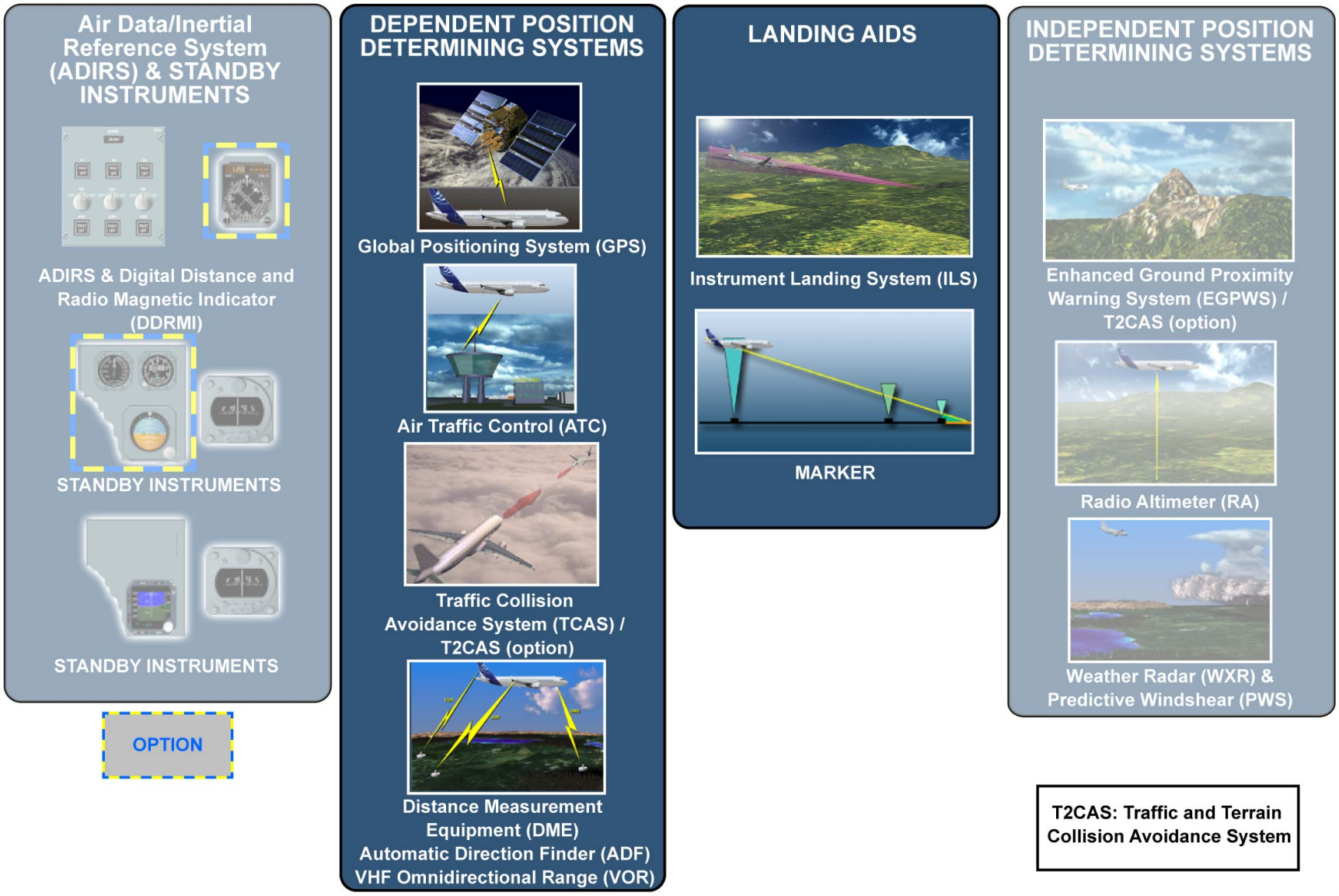
DO NOT TOUCH PROBES AFTER TEST, THEY ARE HOT

SAFETY PRECAUTIONS

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

LANDING AIDS

The navigation systems that require external inputs of the aircraft to operate are: the landing aids systems and the dependent position determining systems. They include:
- ILS,
- marker system,
- GPS,
- ATC/Traffic Collision Avoidance System (TCAS)/Traffic and Terrain Collision Avoidance System (T2CAS) as option,
- DME,
- ADF,
- VOR.


Air Data/Inertial Reference System (ADIRS) & STANDBY INSTRUMENTS
ADIRS & Digital Distance and Radio Magnetic Indicator (DDRMI)
STANDBY INSTRUMENTS
STANDBY INSTRUMENTS
OPTION
DEPENDENT POSITION DETERMINING SYSTEMS
Global Positioning System (GPS)
Air Traffic Control (ATC)
Traffic Collision Avoidance System (TCAS) / T2CAS (option)
Distance Measurement Equipment (DME)
Automatic Direction Finder (ADF)
VHF Omnidirectional Range (VOR)
LANDING AIDS
Instrument Landing System (ILS)
MARKER
INDEPENDENT POSITION DETERMINING SYSTEMS
Enhanced Ground Proximity Warning System (EGPWS) / T2CAS (option)
Radio Altimeter (RA)
Weather Radar (WXR) & Predictive Windshear (PWS)
T2CAS: Traffic and Terrain Collision Avoidance System

LANDING AIDS

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

LANDING AIDS (continued)

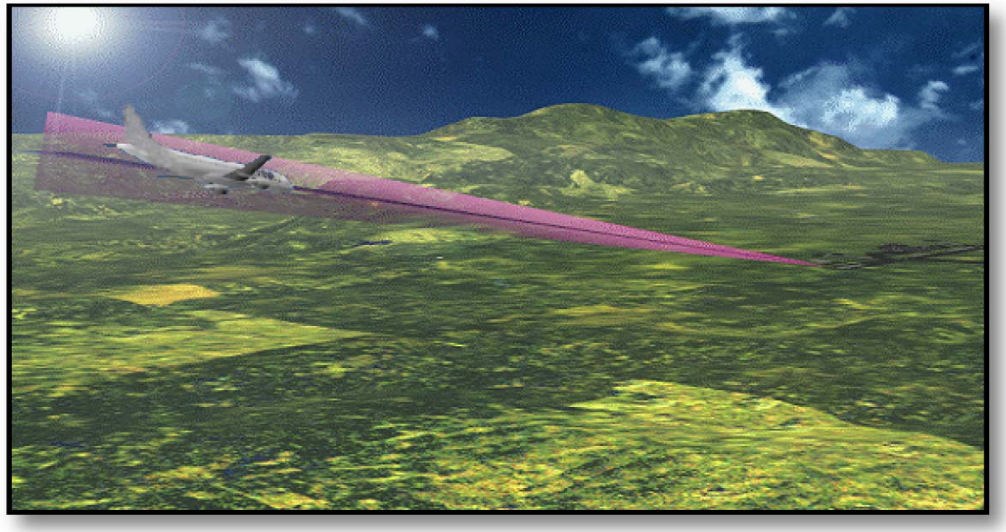
ILS AND MARKER SYSTEM

The ILS sends to the flight crew or Autopilot (AP) signals for optimum descent path for landing. The ILS signal reception is done in part by the Multi-Mode Receiver (MMR). The system gives lateral guidance and vertical guidance to the aircraft approaching the runway.
The marker beacon system is a radio navigation aid that, in conjunction with an instrument landing system, indicates the distance between the A/C and the runway threshold. The marker function is done inside the VOR receivers, but it is only active in VOR 1. There are three types of marker beacons:
- the outer marker,
- the middle marker,
- the inner marker.

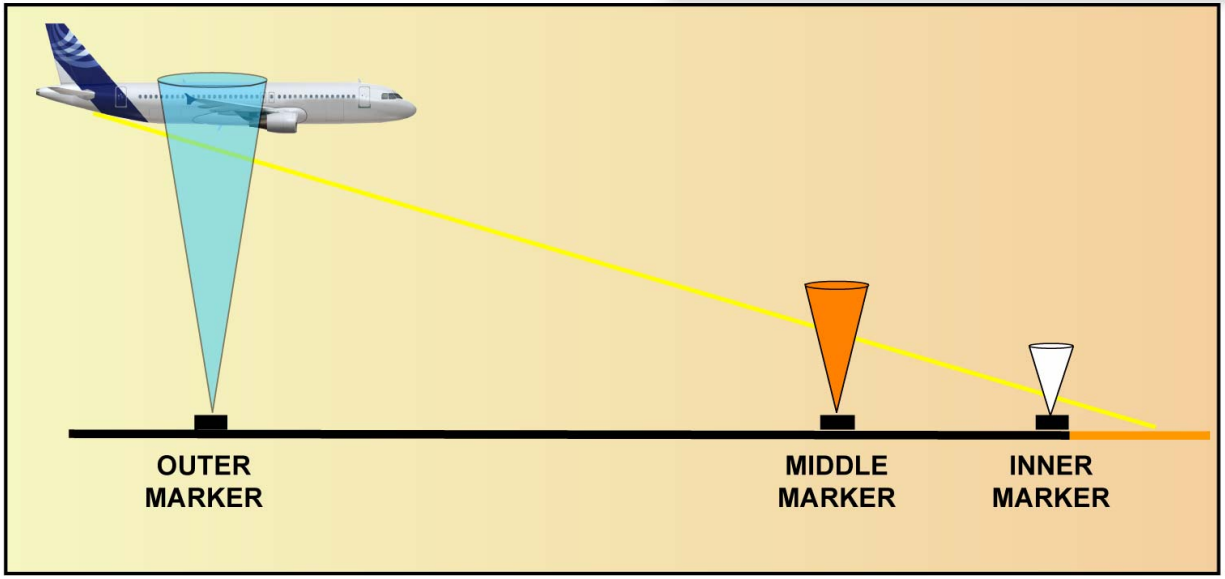
When the aircraft goes over the beacons, the marker beacon information is displayed flashing on the PFDs, with related audio signals.

UGB13131 - U2AT4M0 - UM34PY000000002

Instrument Landing System (ILS)



MARKER BEACONS



LANDING AIDS - ILS AND MARKER SYSTEM

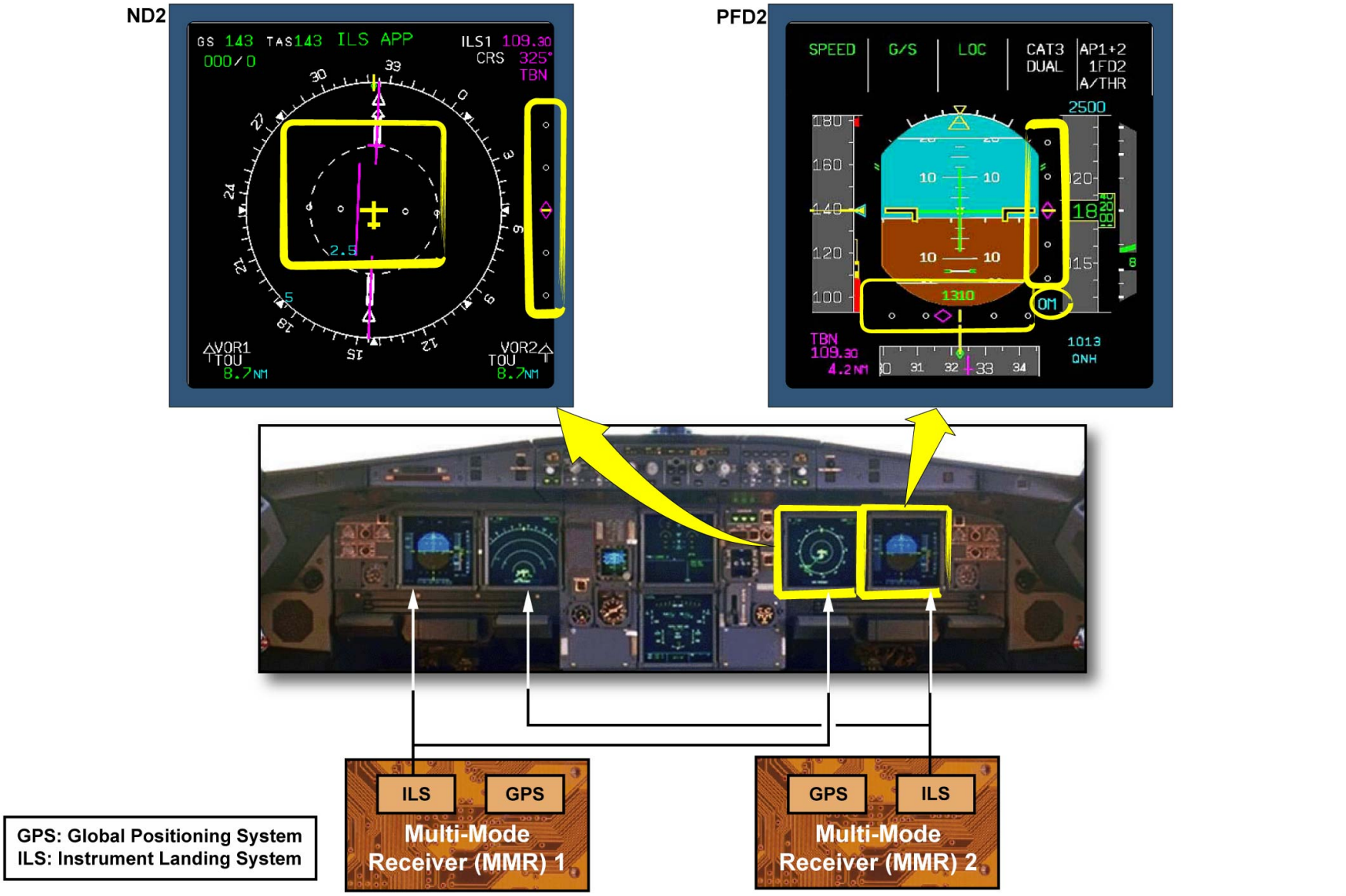
34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

LANDING AIDS (continued)

LANDING AIDS CONTROL AND INDICATING

The ILS information is displayed on the PFDs as 2 scales. One horizontal scale for the localizer signal and one vertical scale for the Glide Slope (G/S) signal.
Note that for redundancy:
- ILS 1 is displayed on PFD 1 and ND 2,
- ILS 2 is displayed on PFD 2 and ND 1.

UGB13131 - U2AT4M0 - UM34PY000000002



LANDING AIDS - LANDING AIDS CONTROL AND INDICATING

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

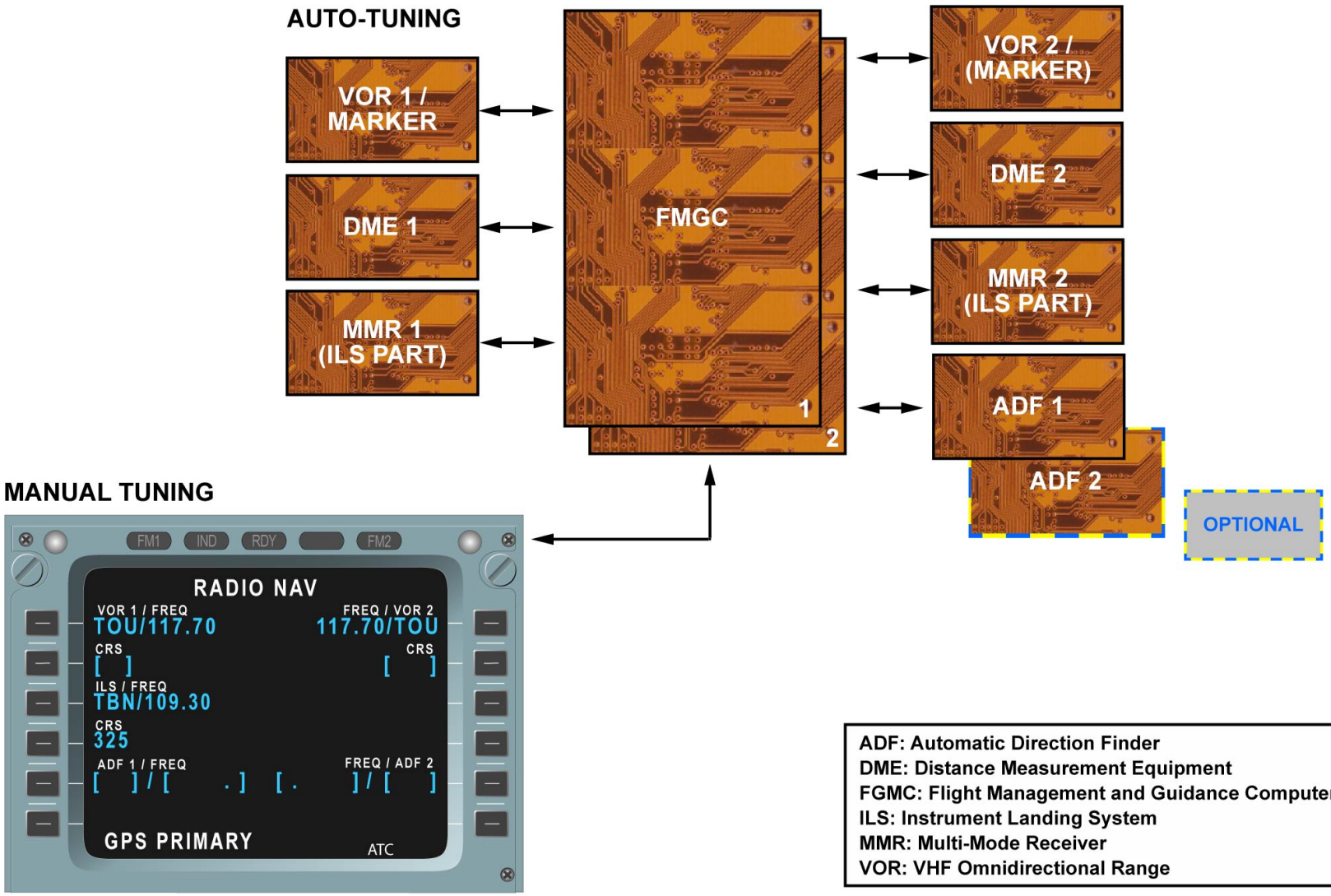
RADIO NAVIGATION SYSTEM

The A/C has the following equipment installed:
- two VOR/marker receivers,
- two DMEs interrogators,
- two MMRs: ILS and GPS,
- two ADFs receivers.

NORMAL TUNING

The Flight Management and Guidance Computers (FMGCs) contain the navigation computer function that calculates the aircraft position. The FMGCs tune the radio navigation receivers automatically and use the navigation info from these receivers for display and also in background for A/C position computation. The Jeppesen database is loaded in the FMGCs. This information includes: station identifiers, and specific information (frequency, identification and coordinates) about the station.

Access to the MCDU RADIO NAV page lets the crew manually tune the radio navigation receivers, via the FMGCs for display. Manual tuning overrides automatic tuning.



RADIO NAVIGATION SYSTEM - NORMAL TUNING

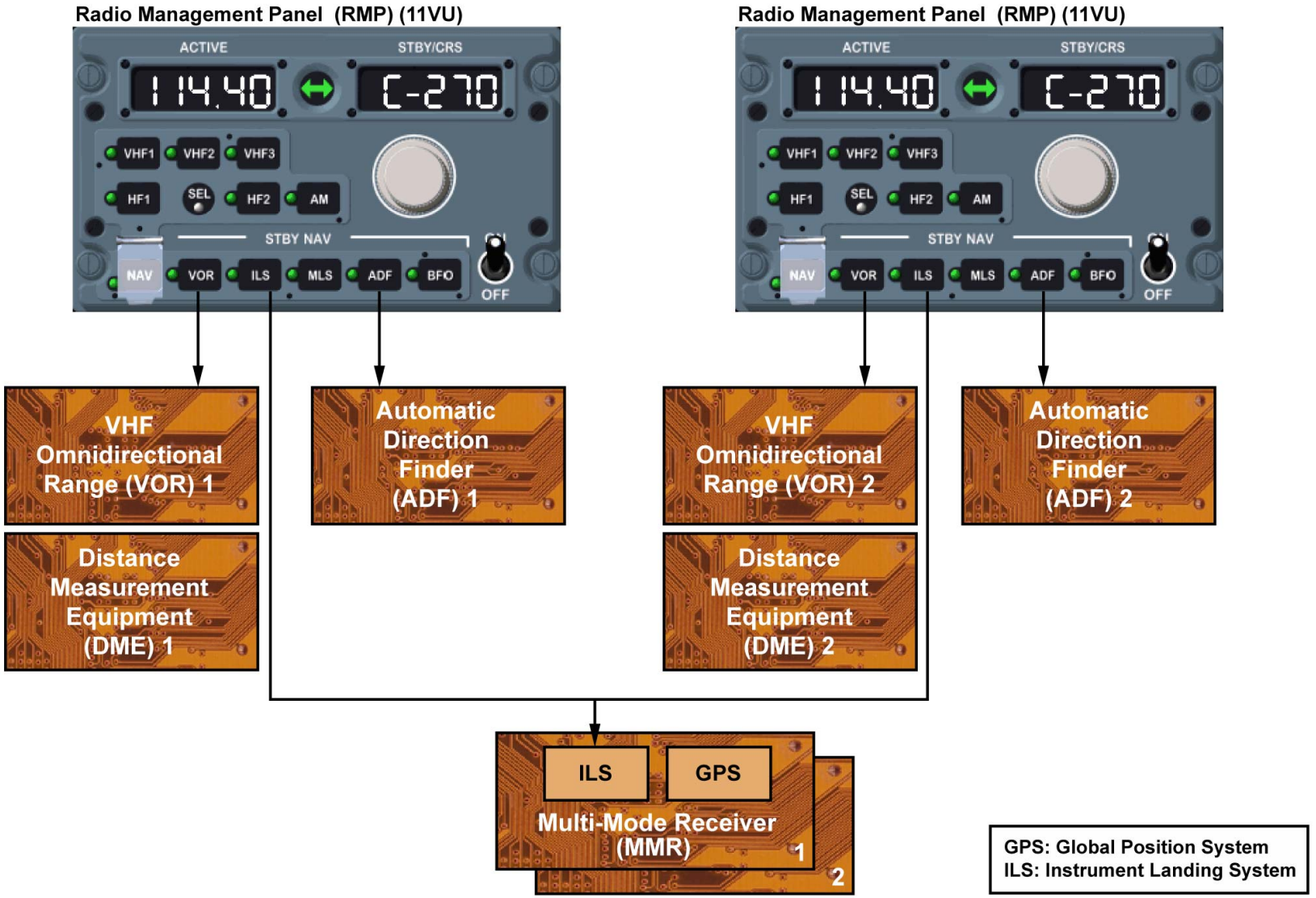
34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

RADIO NAVIGATION SYSTEM (continued)

BACKUP TUNING

Radio Management Panel (RMP) 1 and 2 are capable of tuning the own side Navigation receivers in backup mode if both FMGCs have failed or both MCDUs have failed and manual tuning is needed by the crew.

UGB13131 - U2AT4M0 - UM34PY000000002



RADIO NAVIGATION SYSTEM - BACKUP TUNING

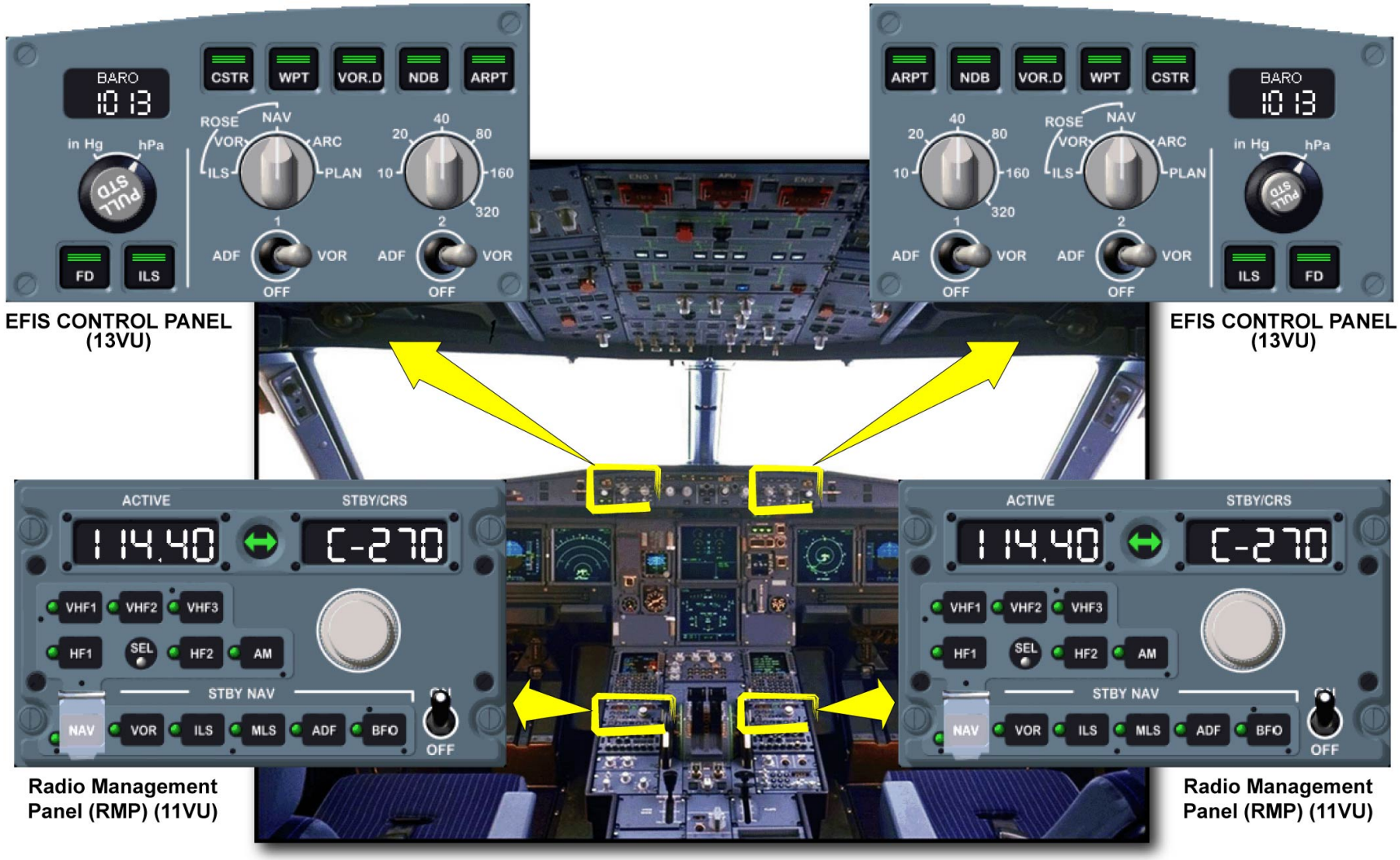
34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

RADIO NAVIGATION SYSTEM (continued)

RADIO NAVIGATION CONTROL and INDICATING

The EFIS control panel mode switches control what type of information is shown to the flight crew on the ND. They are located on both sides of the glareshield. The toggle switches on the EFIS control panel enable the display of the VOR or ILS pointers on the ND. RMPs are located on the center pedestal.

UGB13131 - U2AT4M0 - UM34PY000000002



RADIO NAVIGATION SYSTEM - RADIO NAVIGATION CONTROL AND INDICATING

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

RADIO NAVIGATION SYSTEM (continued)

ND MODES

There are five different ND modes that can be selected via the EFIS control panels. These modes are the PLAN, ARC, NAV, VOR, and ILS modes.

UGB13131 - U2AT4M0 - UM34PY000000002

PLAN MODE

ARC MODE

ILS MODE

VOR MODE

NAV MODE

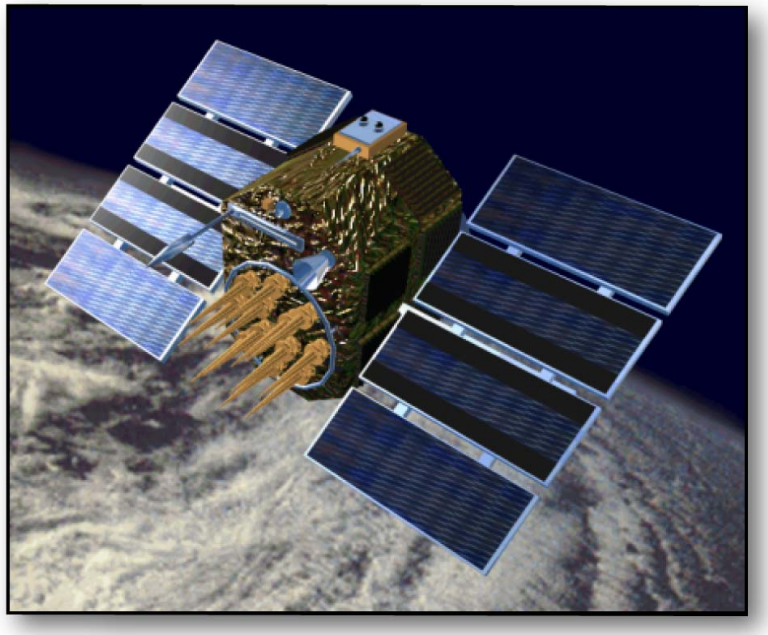
RADIO NAVIGATION SYSTEM - ND MODES

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

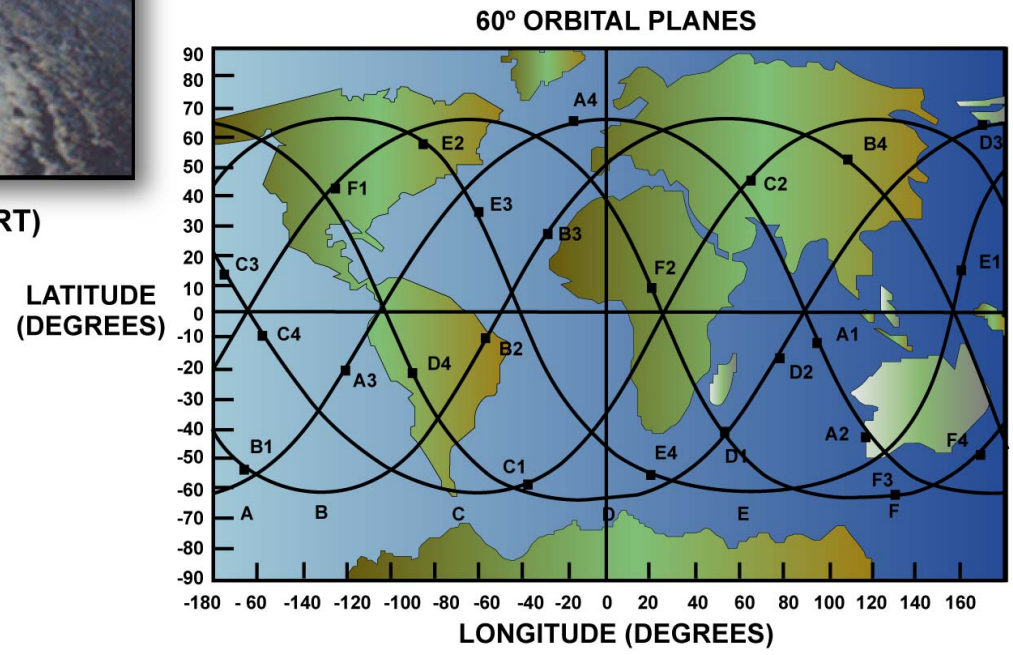
MMR (GPS PART) SYSTEM

The GPS receiver uses data sent by 24 satellites.

UGB13131 - U2AT4M0 - UM34PY000000002



Multi-Mode Receiver (MMR) (GPS PART)



MMR (GPS PART) SYSTEM

UGB13131 - U2AT4M0 - UM34PY000000002

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

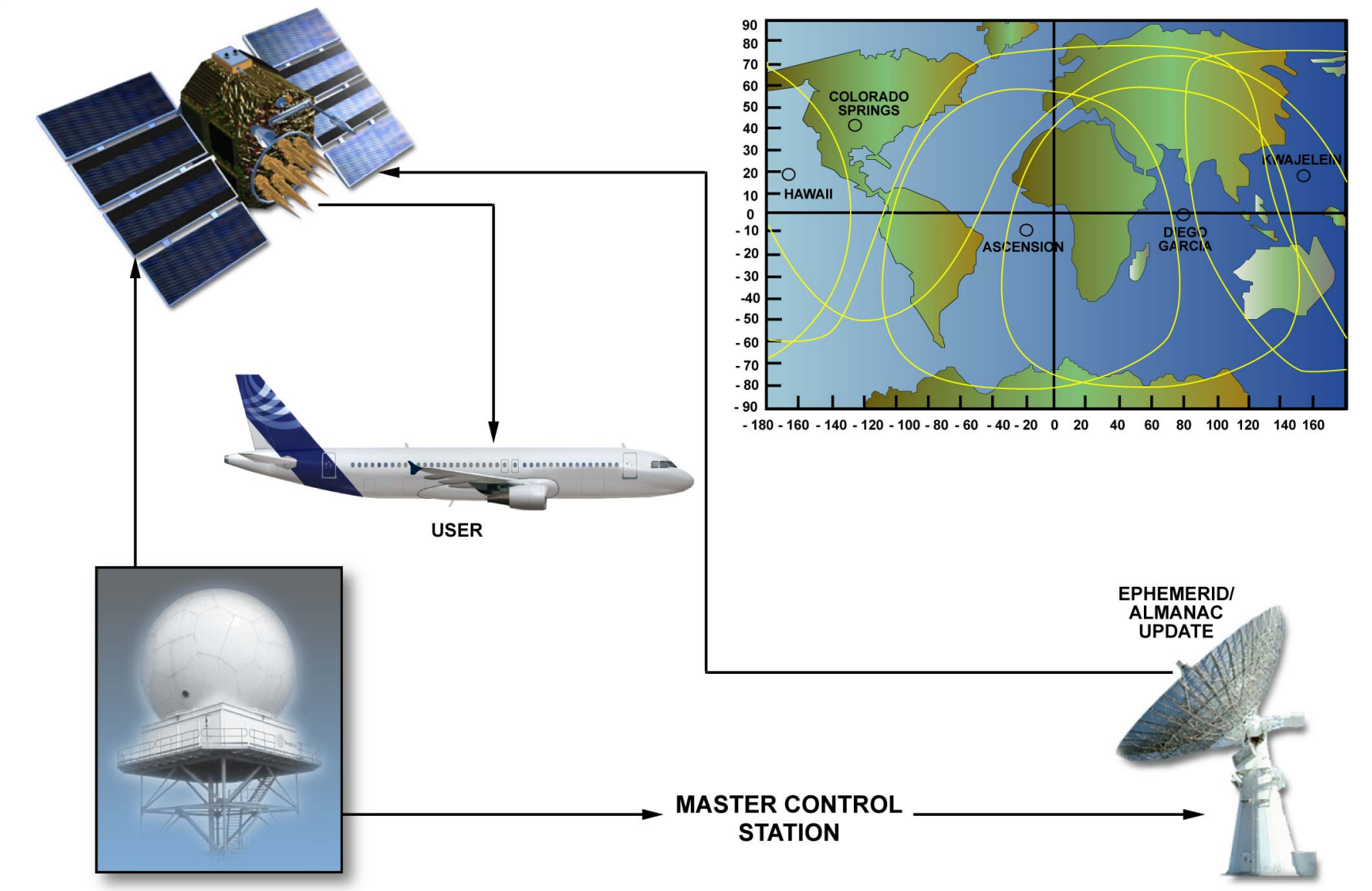
MMR (GPS PART) SYSTEM (continued)

NETWORK ARCHITECTURE

GPS data may be processed and used by anyone. The satellite system transmits precise phase, and time signals. These signals are decoded, synchronized and triangulated by the receivers.
There are four monitor stations:
- Hawaii,
- Ascension Island,
- Diego Garcia,
- Kwajelein.

The master control station transmits orbital decay information (Ephemerid data) back to the satellites so that, in the user receiver, these distance errors can be compensated. The system gives accurate position, altitude and time information. This information is supplied to the FMGCs for aircraft present position calculation.

UGB13131 - U2AT4M0 - UM34PY000000002



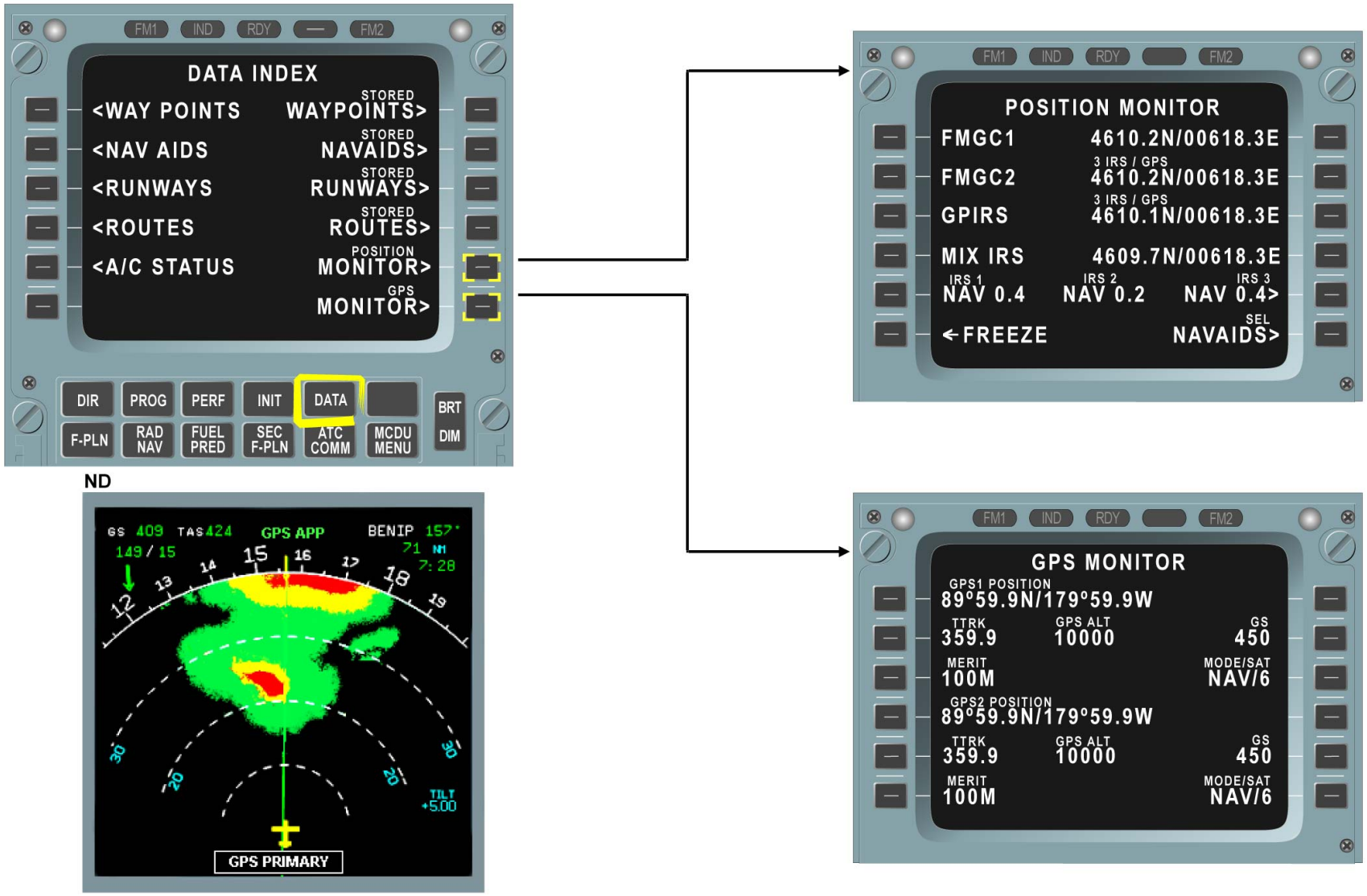
MMR (GPS PART) SYSTEM - NETWORK ARCHITECTURE

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

MMR (GPS PART) SYSTEM (continued)

GPS CONTROL AND INDICATING

The GPS data is accessible on the MCDU. Selecting DATA page P/B on the MCDU and then the GPS monitor line select key, will give the information related to the GPS receivers.
GPS when receiving adequate signals to calculate a present position will be annotated at the bottom of the ND. This is displayed as "GPS PRIMARY".

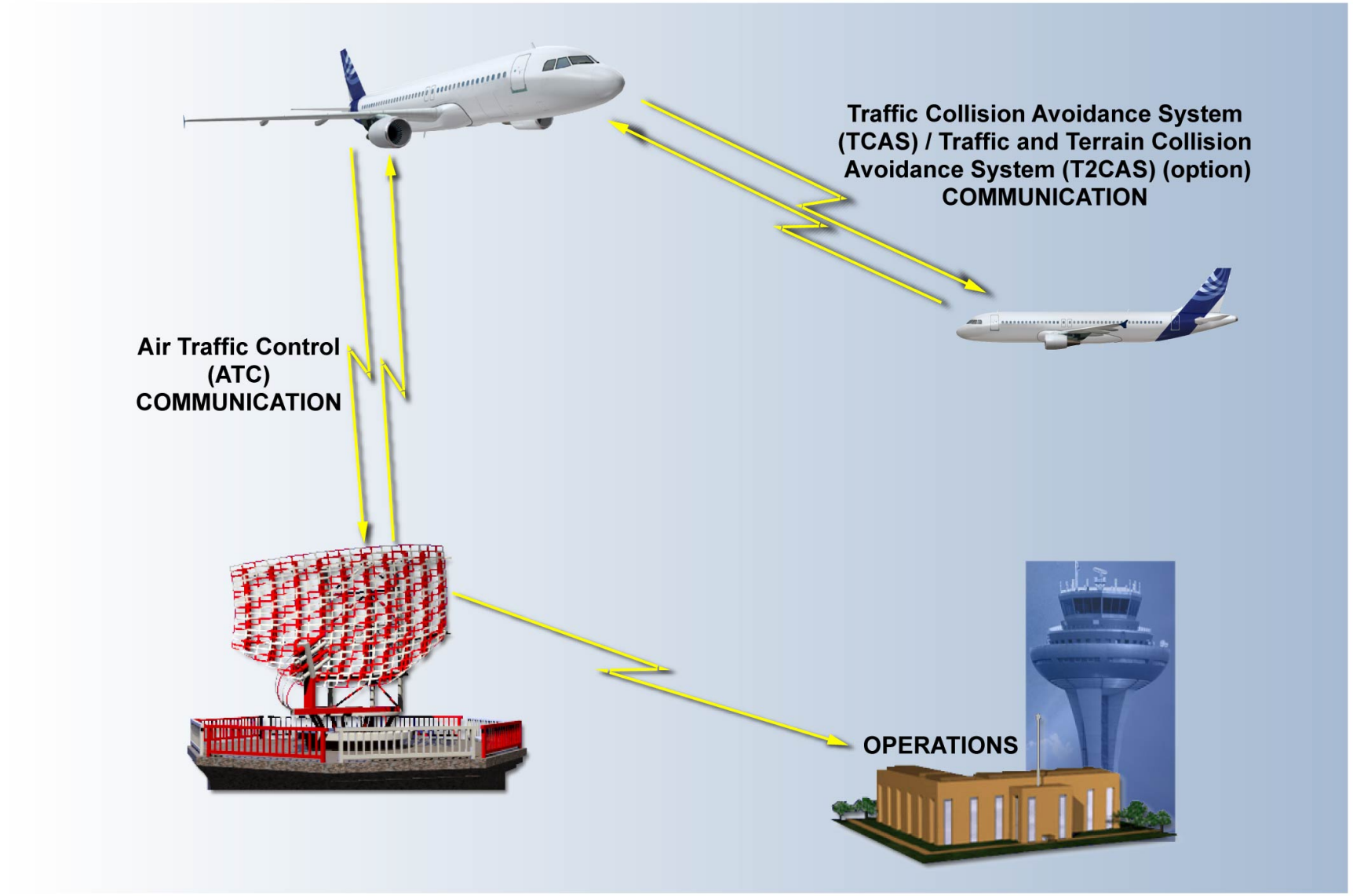


MMR (GPS PART) SYSTEM - GPS CONTROL AND INDICATING

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

ATC/TCAS SYSTEM

The Single Aisle family has two ATC transponders, which respond to the ATC secondary surveillance radar and TCAS (or T2CAS option) interrogations.


Traffic Collision Avoidance System (TCAS) / Traffic and Terrain Collision Avoidance System (T2CAS) (option) COMMUNICATION
Air Traffic Control (ATC) COMMUNICATION
OPERATIONS

ATC/TCAS SYSTEM

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

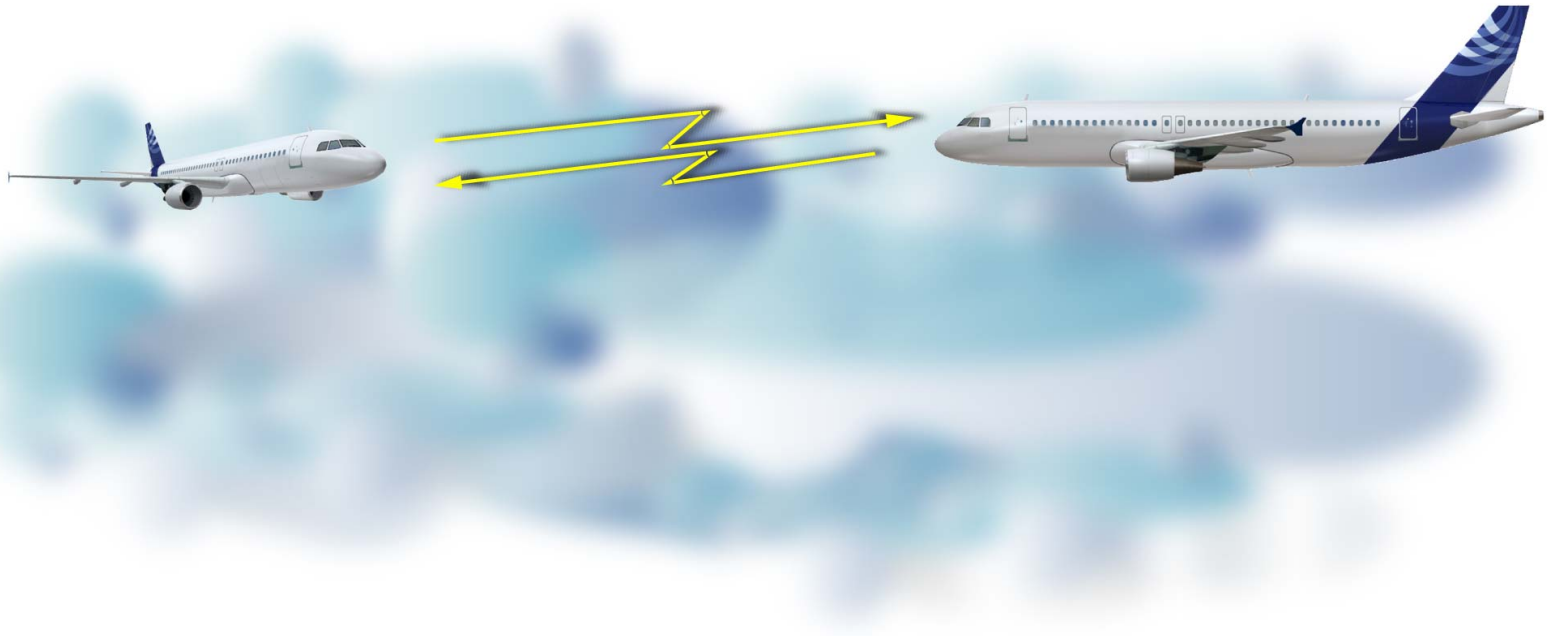
ATC/TCAS SYSTEM (continued)

TCAS PRINCIPLE

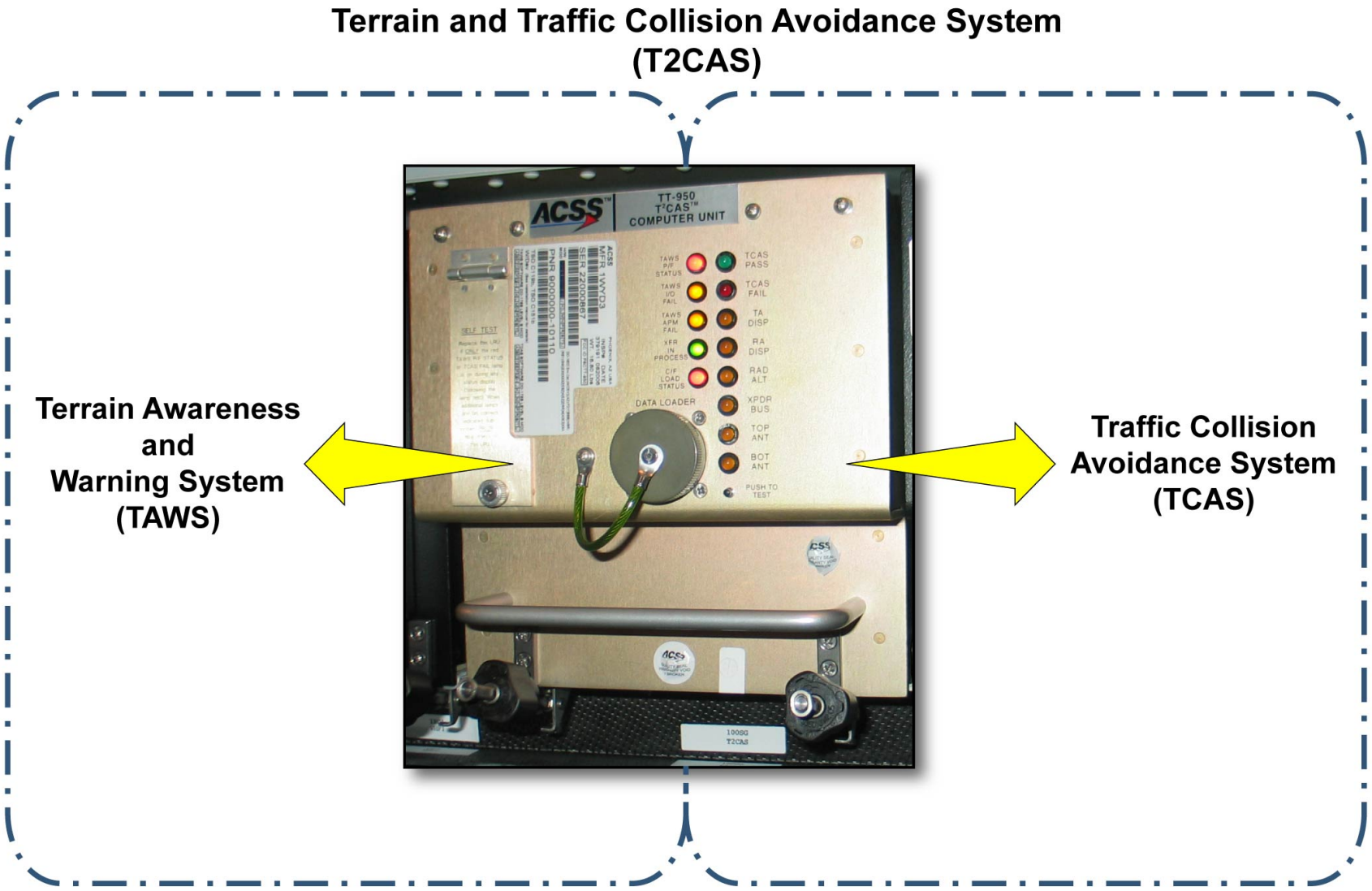
The TCAS gives traffic information and warnings of potential conflicts to the crew, with vertical avoidance instructions.
TCAS can only detect and indicate intruders that have at least one operative ATC transponder.

NOTE: Only one transponder can operate at one time.
The Traffic and Terrain Collision Avoidance System (T2CAS) is a combination of two functions in a single line replaceable unit (LRU). The Terrain Awareness and Warning System (TAWS) of the T2CAS is the part of the T2CAS that ensures the EGPWS functions. The Traffic Collision avoidance System (TCAS) part of the T2CAS is the part that ensures the same functions as the TCAS.

UGB13131 - U2AT4M0 - UM34PY000000002



ATC/TCAS SYSTEM - TCAS PRINCIPLE



ATC/TCAS SYSTEM - TCAS PRINCIPLE

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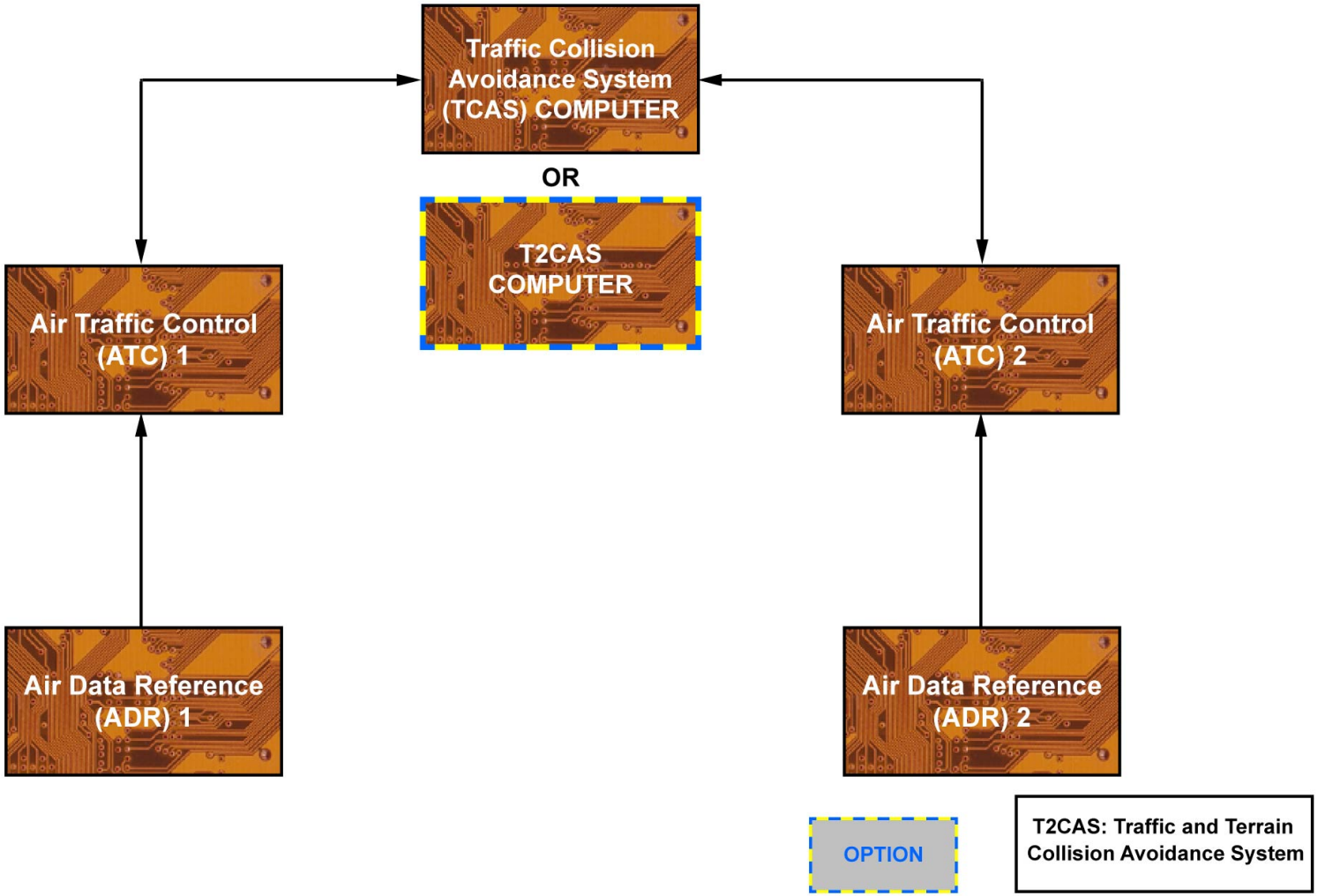
UGB13131 - U2AT4M0 - UM34PY000000002

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

ATC/TCAS SYSTEM (continued)

ATC/TCAS SYSTEM

In normal operation Air Data Reference (ADR) 1 supplies barometric information to ATC 1, ADR 2 supplies ATC 2.
The ATC transponder is an integral part of the ATC radar beacon system. The transponder is interrogated by the ground station and replies with a series of pulses. These reply pulses are coded to supply identification MODE A and altitude reporting MODE C, and selective call and flight data MODE S on the Air Traffic Controllers (ATCs) radar scope.
This information enables the controller to distinguish the A/C and to maintain effective ground surveillance of the air traffic.


Traffic Collision Avoidance System (TCAS) COMPUTER
OR
T2CAS COMPUTER
Air Traffic Control (ATC) 1
Air Traffic Control (ATC) 2
Air Data Reference (ADR) 1
Air Data Reference (ADR) 2
OPTION
T2CAS: Traffic and Terrain Collision Avoidance System

ATC/TCAS SYSTEM - ATC/TCAS SYSTEM

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

ATC/TCAS SYSTEM (continued)

ATC/TCAS CONTROL AND INDICATING

The single control panel on the center pedestal is used for the controls of the ATC and TCAS (or T2CAS) systems.

UGB13131 - U2AT4M0 - UM34PY000000002

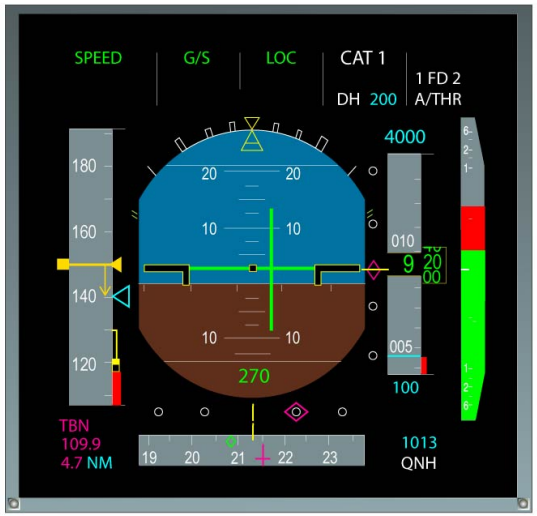
ATC/TCAS SYSTEM - ATC/TCAS CONTROL AND INDICATING

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

ATC/TCAS SYSTEM (continued)

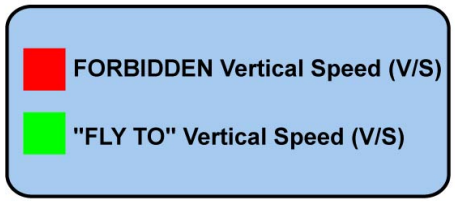
TCAS INDICATING

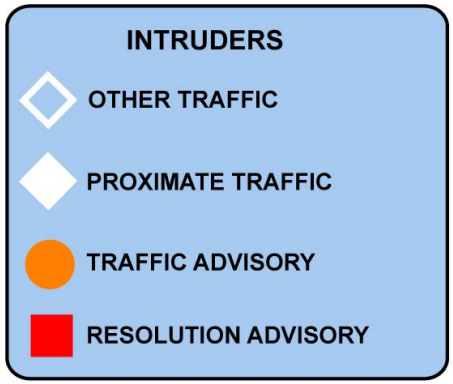
Here are the different indications that are given by the TCAS (or T2CAS) computer linked to audio warnings.



PFD

ND





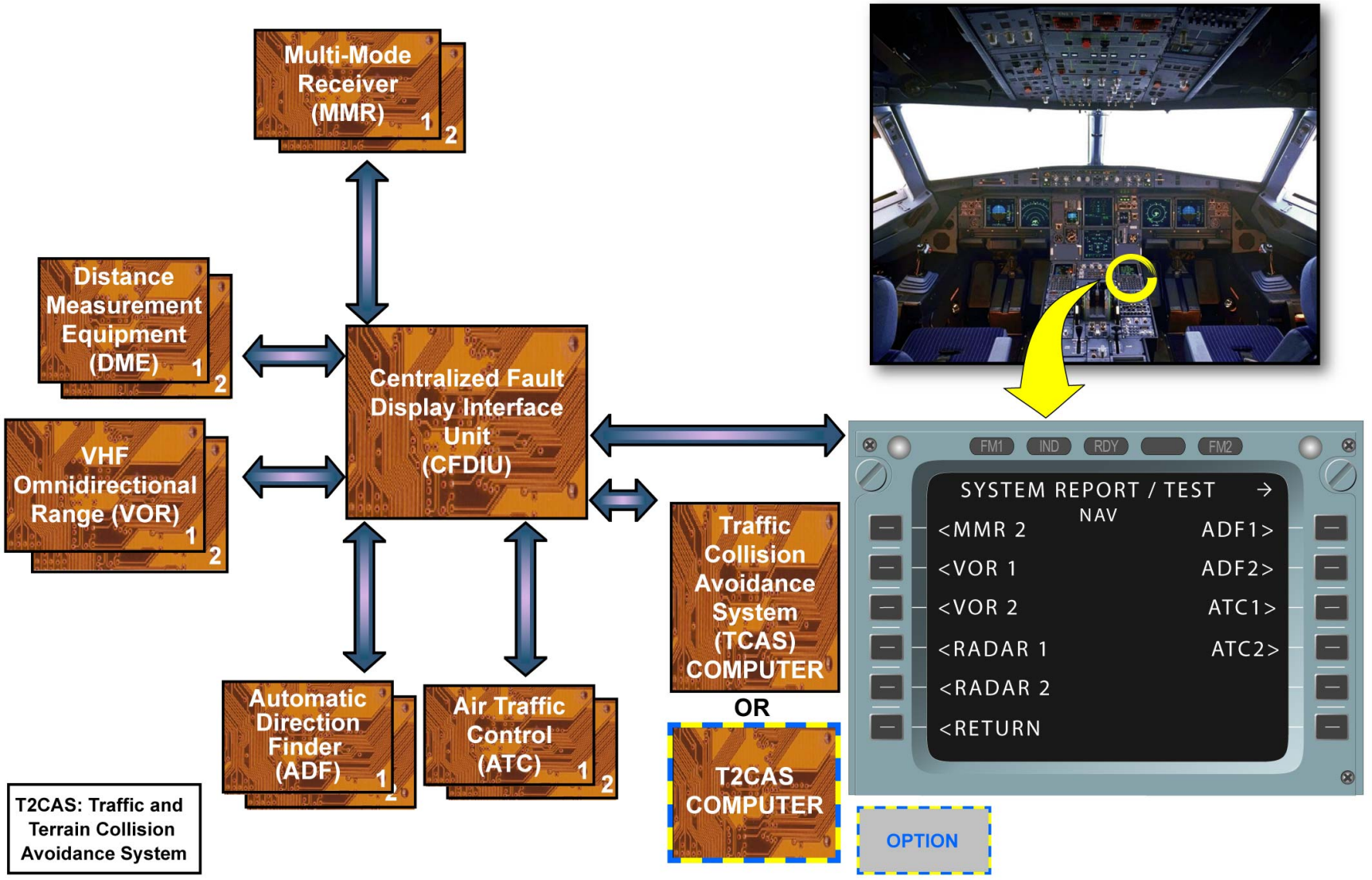
ATC/TCAS SYSTEM - TCAS INDICATING

34 DEPENDENT POS DETERMINING SYS & LAND AIDS (1)

MAINTENANCE/TEST FACILITIES

All navigation systems can be tested from the MCDUs.

UGB13131 - U2AT4M0 - UM34PY000000002



MAINTENANCE/TEST FACILITIES

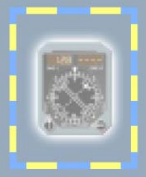
34 INDEPENDENT POS DETERMINING SYS PRES. (1)

GENERAL

The Independent Position determining systems include:
- Enhanced Ground Proximity Warning System (EGPWS) or Traffic and Terrain Collision Avoidance System (T2CAS) as option,
- Radio Altimeters (RAs),
- Weather Radar (WXR) and Predictive Windshear (PWS).

These systems do not rely on external sources to give to the flight crew the position determination.

Air Data/Inertial Reference System (ADIRS) & STANDBY INSTRUMENTS



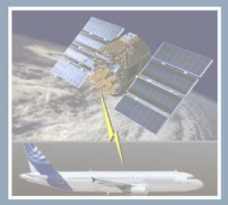
ADIRS & Digital Distance and Radio Magnetic Indicator (DDRMI)

STANDBY INSTRUMENTS

STANDBY INSTRUMENTS

OPTION

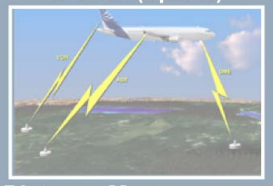
DEPENDENT POSITION DETERMINING SYSTEMS



Global Positioning System (GPS)

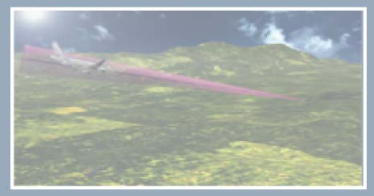
Air Traffic Control (ATC)

Traffic Collision Avoidance System (TCAS) / T2CAS (option)

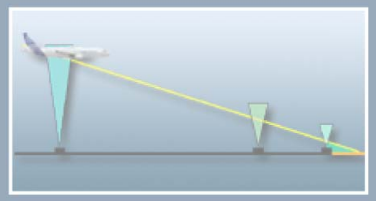


Distance Measurement Equipment (DME)
Automatic Direction Finder (ADF)
VHF Omnidirectional Range (VOR)

LANDING AIDS



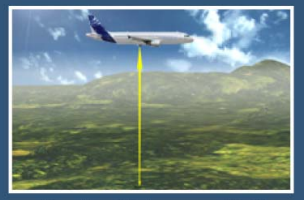
Instrument Landing System (ILS)



MARKER

INDEPENDENT POSITION DETERMINING SYSTEMS

Enhanced Ground Proximity Warning System (EGPWS) / T2CAS (option)



Radio Altimeter (RA)

Weather Radar (WXR) & Predictive Windshear (PWS)

T2CAS: Traffic and Terrain Collision Avoidance System

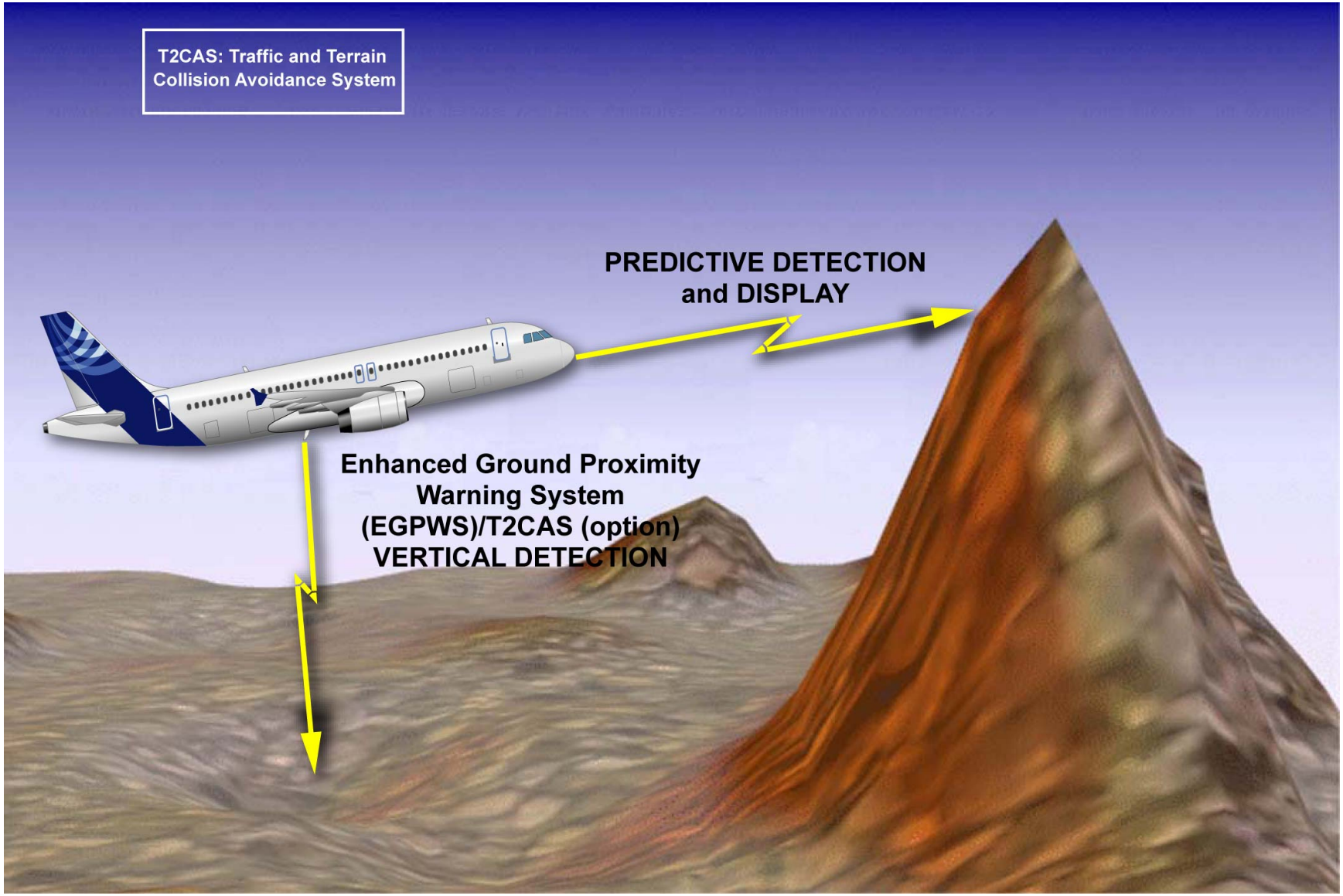
GENERAL

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

EGPWS

The function of the EGPWS is to launch aural and visual warnings if the A/C adopts a potentially hazardous configuration of Controlled Flight Into Terrain (CFIT).
This system has five basic Enhanced Ground Proximity Warning System (EGPWS) modes and has 2 TERRAIN modes called TERRAIN Clearance Function (TCF) and the TERRAIN Awareness and Display (TAD).
As an option, the T2CAS can replace the EGPWS.

UGB13131 - U2AT4M0 - UM34PX000000002


T2CAS: Traffic and Terrain
Collision Avoidance System
PREDICTIVE DETECTION
and DISPLAY
Enhanced Ground Proximity
Warning System
(EGPWS)/T2CAS (option)
VERTICAL DETECTION

EGPWS

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

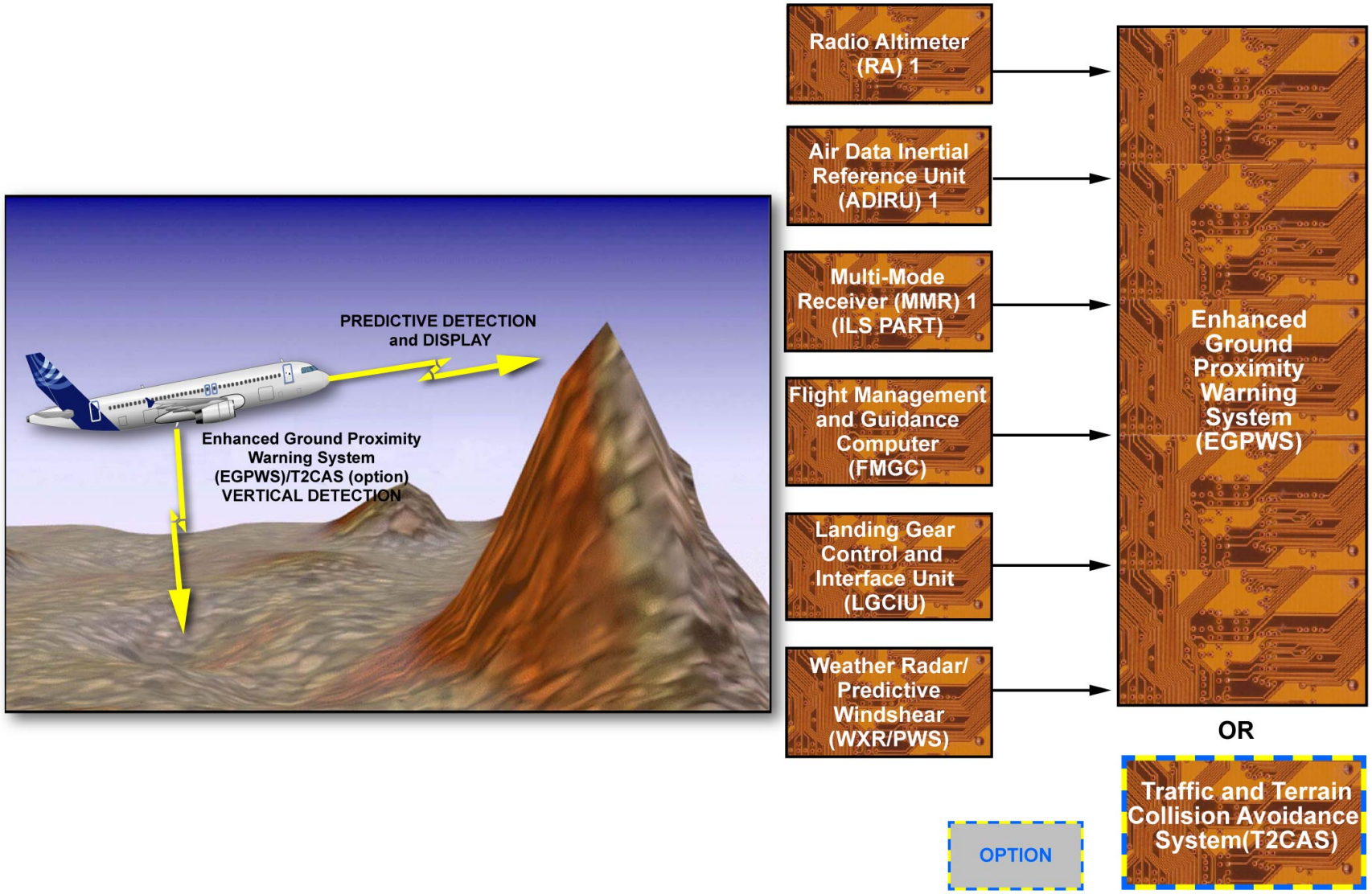
EGPWS (continued)

SYSTEM ARCHITECTURE

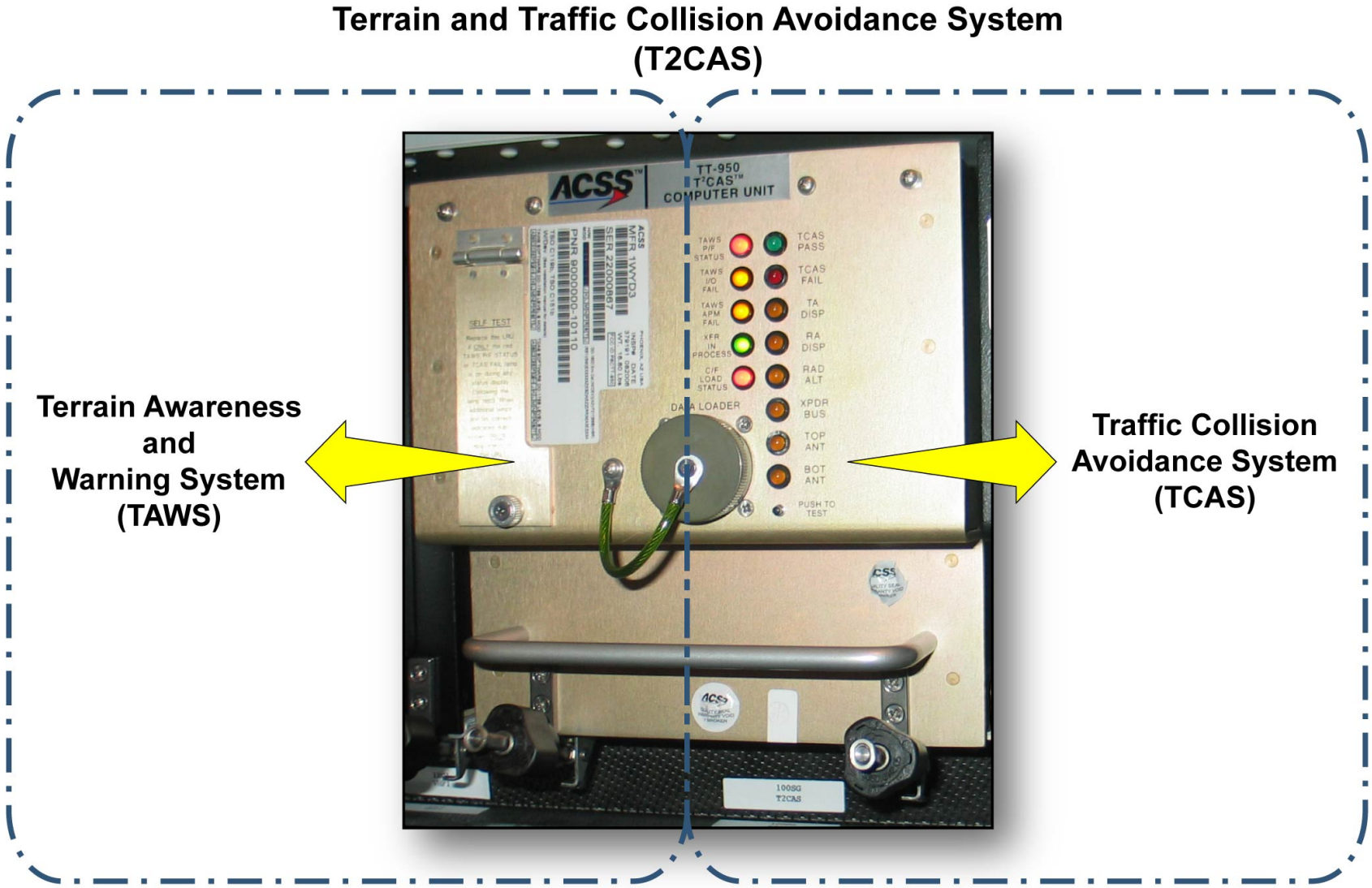
The EGPWS computer (or T2CAS computer as an option) processes the data from:
- RA 1,
- Air Data/Inertial Reference Unit (ADIRU) 1,
- Multi-Mode Receiver (MMR) 1 (Instrument Landing System (ILS) part),
- Flight Management and Guidance Computer (FMGC) 1,
- Landing Gear Control and Interface Unit (LGCIU) 1,
- WXR/PWS (for ND image source selection between both systems).

The Traffic Collision avoidance System (TCAS) part of the T2CAS is the part that carries out the TCAS functions.
The Terrain Awareness and Warning System (TAWS) of the T2CAS is the part of the T2CAS that carries out the EGPWS functions such as:
- basic TAWS modes base on Radio Altitude (RA),
- predictive TAWS modes: Collision Prediction and Alerting (CPA) function and Terrain Hazard Display (THD) which gives a forward-looking terrain alerting capability.

UGB13131 - U2AT4M0 - UM34PX000000002



EGPWS - SYSTEM ARCHITECTURE



EGPWS - SYSTEM ARCHITECTURE

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UGB13131 - U2AT4M0 - UM34PX000000002

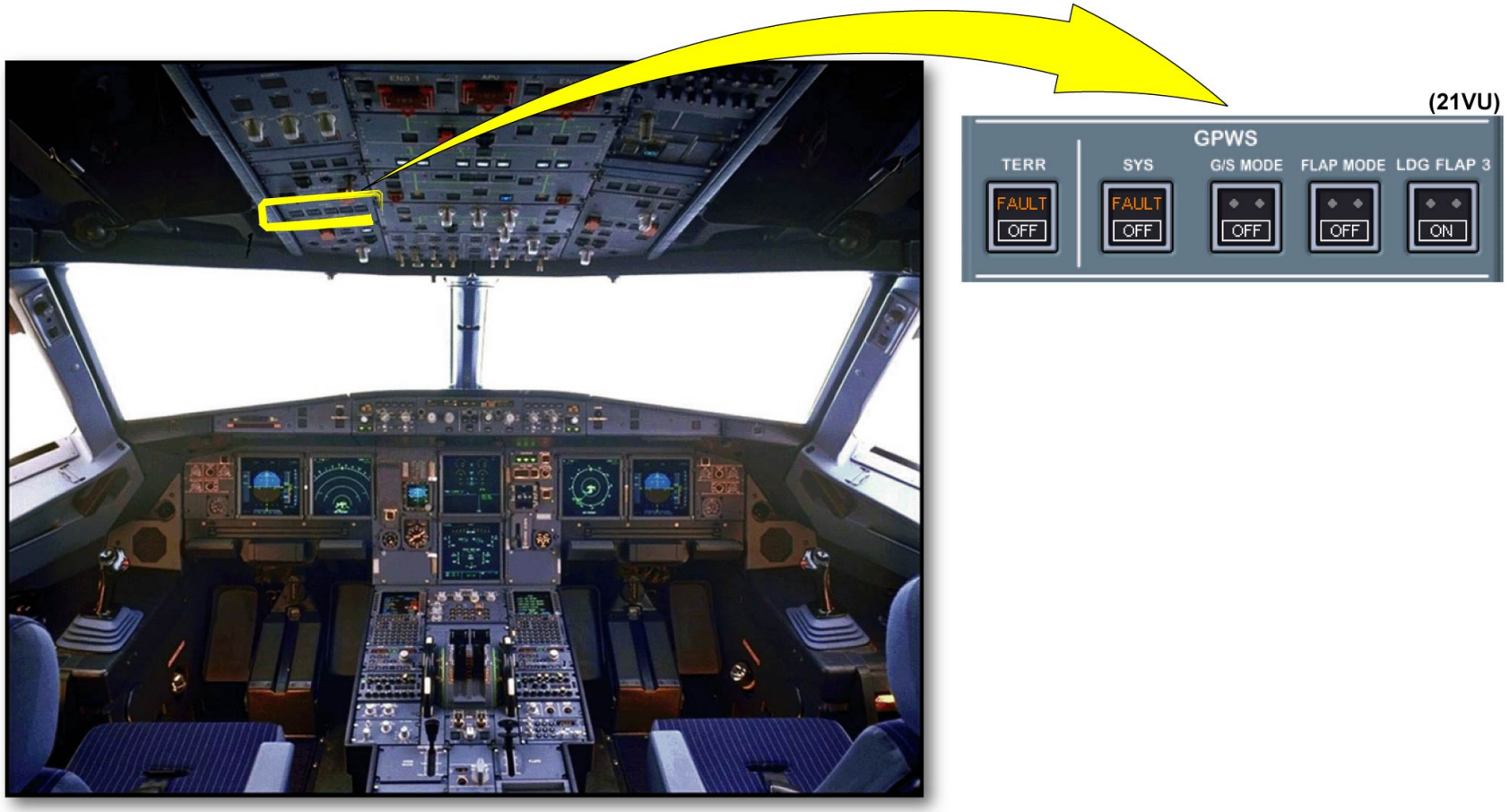
34 INDEPENDENT POS DETERMINING SYS PRES. (1)

EGPWS (continued)

GPWS PANEL

The GPWS/T2CAS control panel is installed on the overhead panel and enables the deactivation of:
- TERRAIN mode,
- complete or partial basic EGPWS mode in specific approach configuration.

UGB13131 - U2AT4M0 - UM34PX000000002



EGPWS - GPWS PANEL

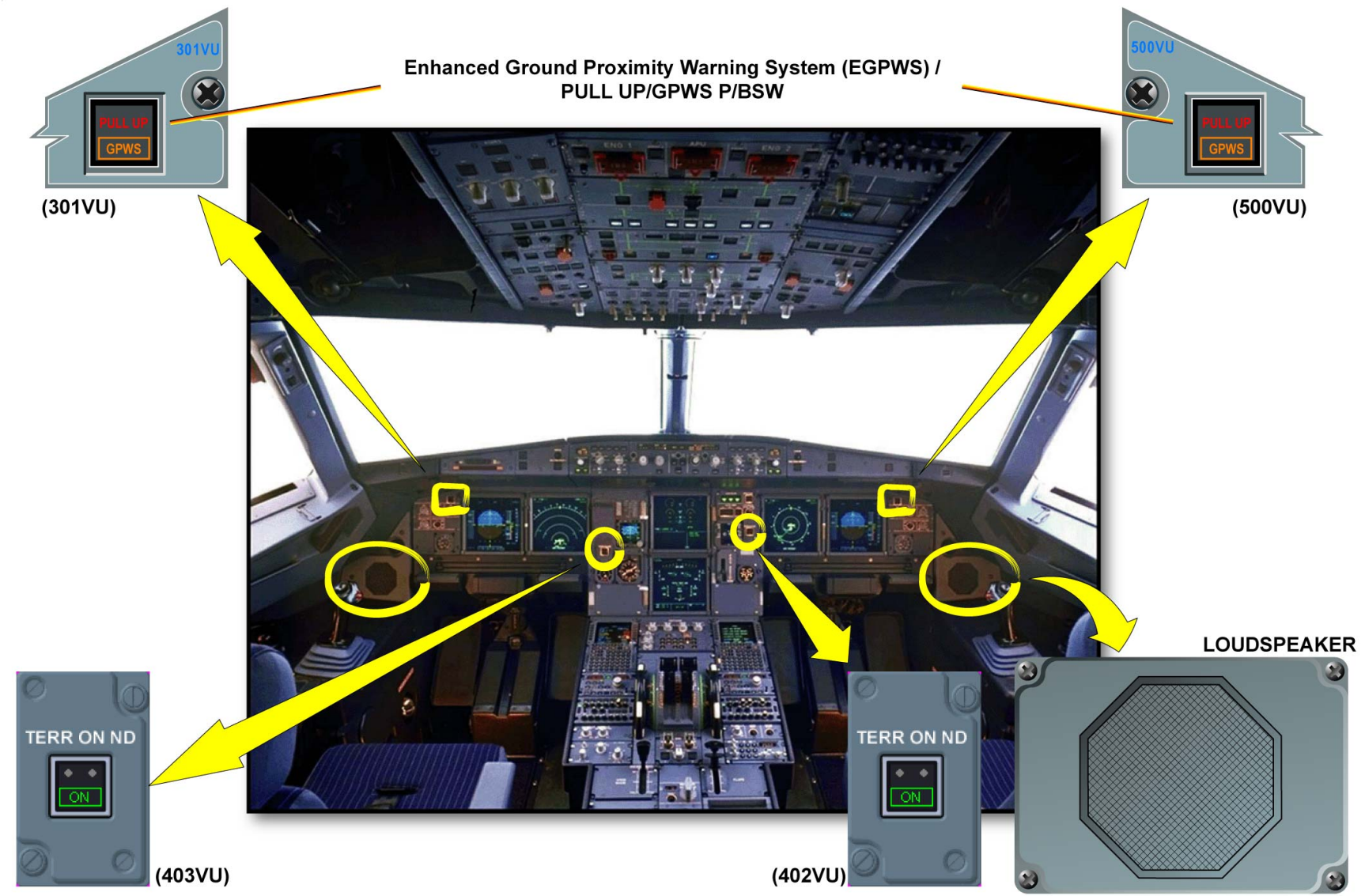
34 INDEPENDENT POS DETERMINING SYS PRES. (1)

EGPWS (continued)

CONTROL AND INDICATING

EGPWS and T2CAS have the same visual warnings that are shown on the instrument panels. Pressing either of the PULL UP/GPWS P/BSW starts the systems test.
In addition, two loudspeakers installed on each lower side of the main panel broadcast EGPWS/T2CAS aural warnings, even if loudspeaker knobs are turned off.
Terrain information will be automatically displayed on the ND if there is any danger within the proximity of the A/C. The terrain elevation surrounding the A/C is color-coded. The TERRain ON ND P/B is used to display the terrain information on the ND all the time on request.

UGB13131 - U2AT4M0 - UM34PX000000002



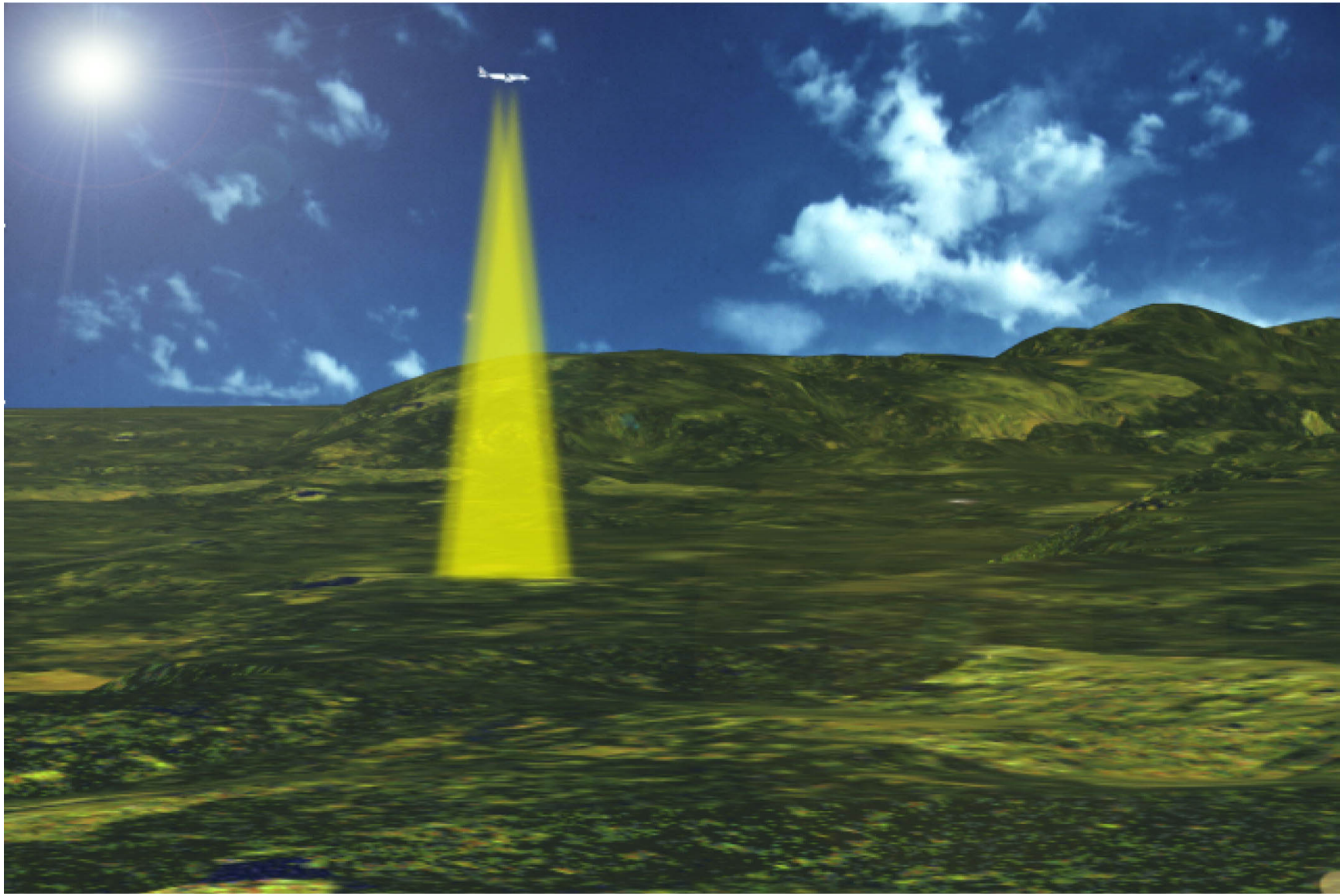
EGPWS - CONTROL AND INDICATING

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

RADIO ALTIMETER

The RAs supply accurate measurement of the A/C height above the ground during initial climb, landing and approach phases.

UGB13131 - U2AT4M0 - UM34PX000000002



RADIO ALTIMETER

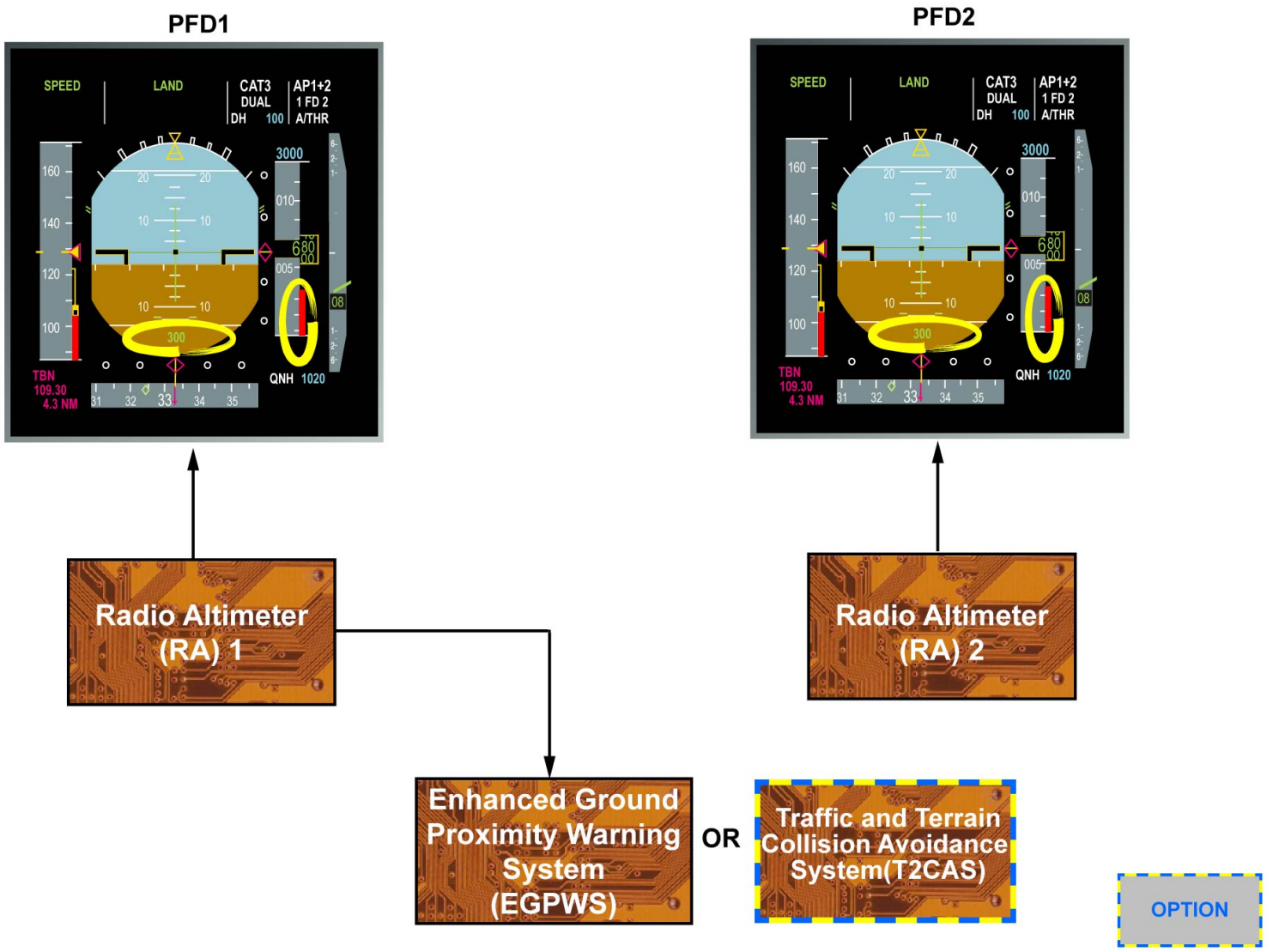
34 INDEPENDENT POS DETERMINING SYS PRES. (1)

RADIO ALTIMETER (continued)

CONTROL AND INDICATING

RA data is supplied to several users and is displayed on both PFDs at all times below 2500 feet Above Ground Level (AGL).
In normal operation, the RA 1 height is displayed on the CAPT PFD and RA 2 height on the F/O PFD.

UGB13131 - U2AT4M0 - UM34PX000000002



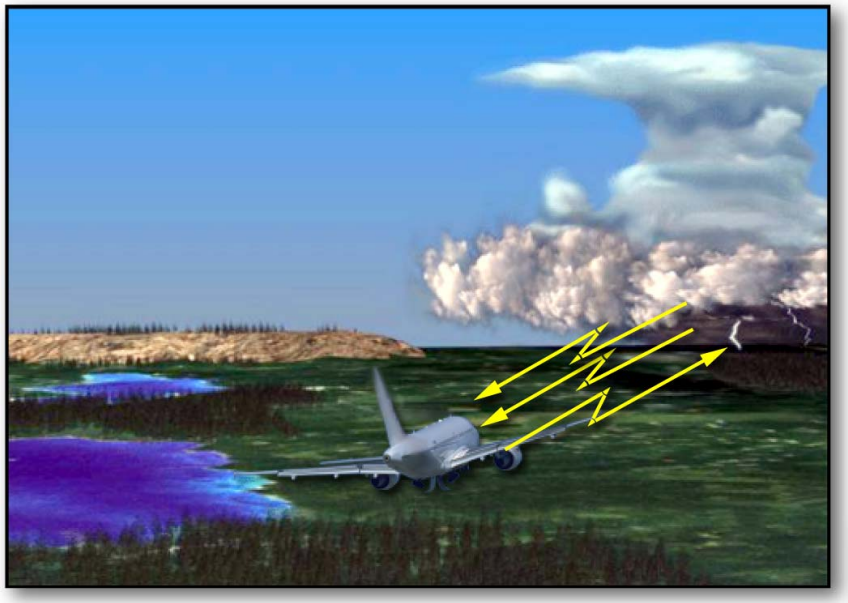
RADIO ALTIMETER - CONTROL AND INDICATING

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

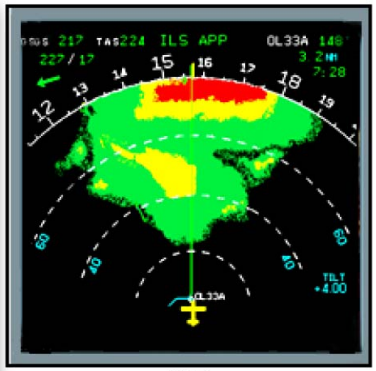
WXR/PWS

WXR is installed to detect precipitation. The displayed returns are shown on the ND.
The weather radar supplies PWS detection. A wind shear event is a sudden change of wind speed and/or direction over a short distance with a downwards and/or upwards movement of a very dangerous air during take off and approach phases.

UGB13131 - U2AT4M0 - UM34PX000000002

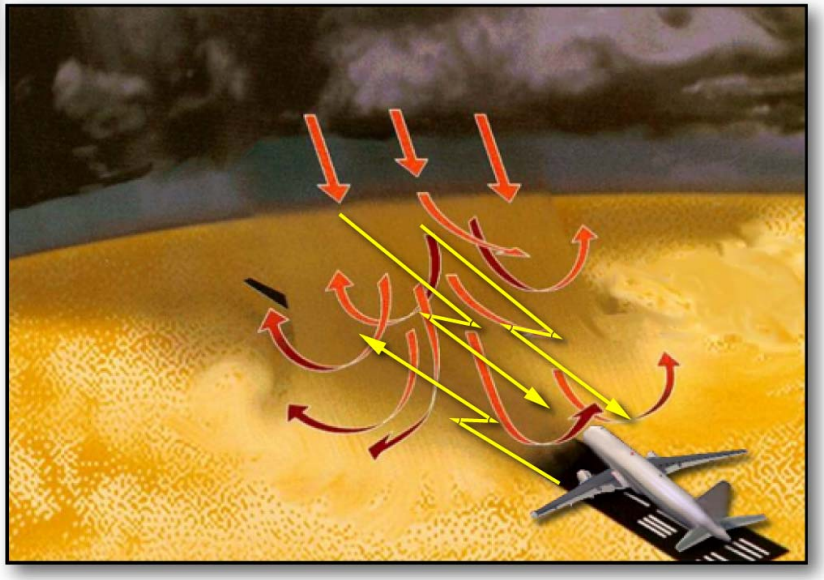


WEATHER RADAR

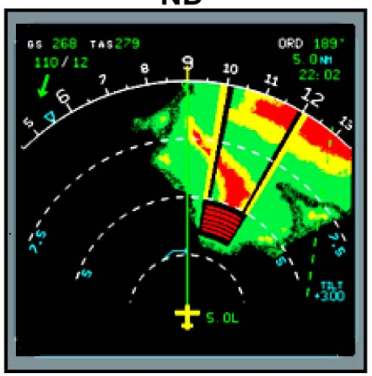


ND

PREDICTIVE WINDSHEAR



ND



WXR/PWS

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

WXR/PWS (continued)

WXR/PWS PANEL

The WXR control panel is installed on the center pedestal. The information is displayed on the CAPT or F/O ND.

WARNING: when the WXR is "ON":
- personnel should not be within 5 meters of the radome,

CAUTION: when the WXR is "ON":
- no metallic obstacle should be within 5 meters,
- no refueling within 60 meters,
- to avoid damage to the A/C.

The multiscan is a radar function that displays all significant weather at all ranges, at all aircraft altitudes, and at all times on a display that is essentially clutter-free, without the need for pilot to input tilt or gain settings. The multiscan function optimizes weather detection and minimizes ground clutter.
The weather radar can operate in autotilt mode (automatic tilt angle): the use of the automatic tilt function is recommended in WX and TURB modes. The autotilt function uses the terrain altitude information of the EGPWS. Based on the aircraft altitude above the terrain and on terrain conditions in the area, the EGPWS determines the optimum tilt angle for the radar
Automatic tilt is selected by setting the MULTISCAN SW to AUTO on the weather radar control unit.
- switch to AUTO: Tilt setting for weather scans is automatic,
- switch to MAN: Tilt is controlled with the manual tilt control knob.

UGB13131 - U2AT4M0 - UM34PX000000002

(187VU)

With Predictive Winshear (PWS) and MULTISCAN function

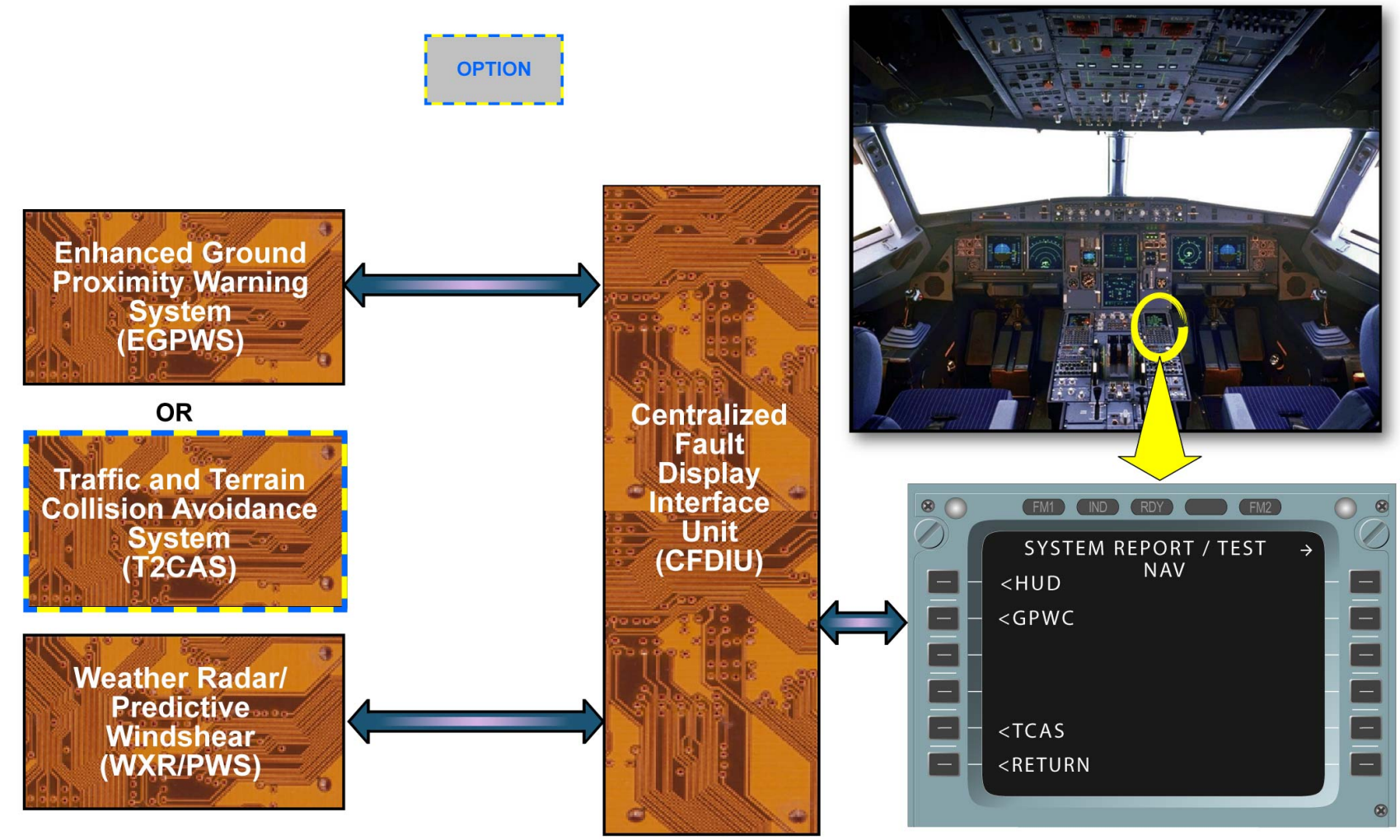
WXR/PWS - WXR/PWS PANEL

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

MAINTENANCE/TEST FACILITIES

All navigation systems can be tested from the MCDUs.

UGB13131 - U2AT4M0 - UM34PX000000002



MAINTENANCE/TEST FACILITIES

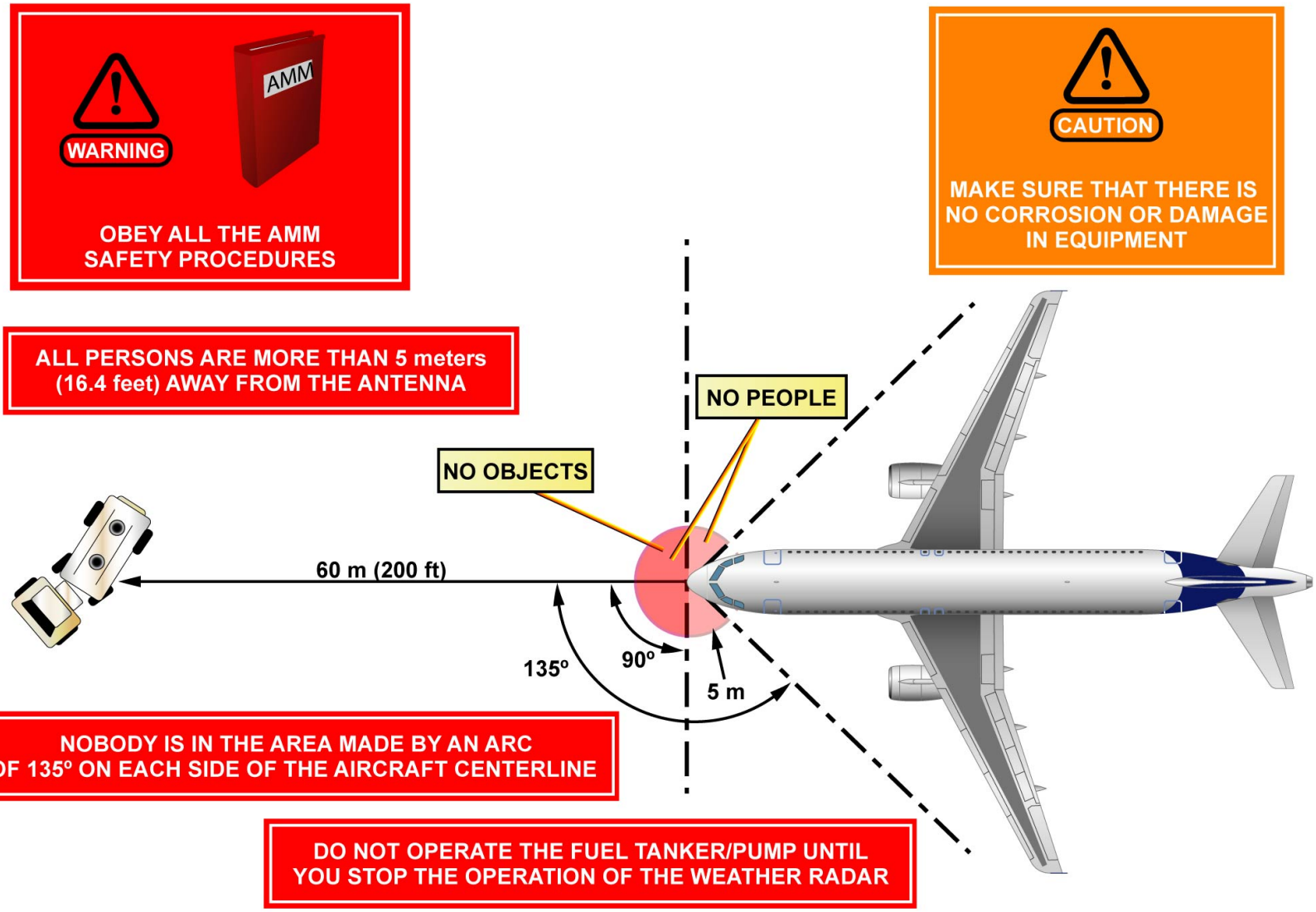
34 INDEPENDENT POS DETERMINING SYS PRES. (1)

SAFETY PRECAUTIONS

When you work on the A/C, make sure that you obey all the Aircraft Maintenance Manual (AMM) procedures. This will prevent injury to persons and/or damage to the A/C.
Make sure that:
- all persons are more than 5 meters (16.4 feet) away from the antenna, nobody is in the area made by an arc of 135 degrees on each side of the A/C centerline.
- all objects and obstacles are more than 5 meters away from the antenna in the area made by an arc of 90 degrees on each side of the A/C centerline.
- Stop the fuel tanker 60 meters from the A/C nose while the weather radar is operating.

Do not operate the fuel tanker/pump until you stop the operation of the weather radar.
Make sure that there is no sign of corrosion or damage and no foreign objects in the test equipment.

UGB13131 - U2AT4M0 - UM34PX000000002


WARNING
AMM
OBEY ALL THE AMM SAFETY PROCEDURES
CAUTION
MAKE SURE THAT THERE IS NO CORROSION OR DAMAGE IN EQUIPMENT
ALL PERSONS ARE MORE THAN 5 meters (16.4 feet) AWAY FROM THE ANTENNA
NO PEOPLE
NO OBJECTS
60 m (200 ft)
135°
90°
5 m
NOBODY IS IN THE AREA MADE BY AN ARC OF 135° ON EACH SIDE OF THE AIRCRAFT CENTERLINE
DO NOT OPERATE THE FUEL TANKER/PUMP UNTIL YOU STOP THE OPERATION OF THE WEATHER RADAR

SAFETY PRECAUTIONS

34 INDEPENDENT POS DETERMINING SYS PRES. (1)

SUMMARY

This picture lists the navigation systems that are installed on the Single Aisle A/C.

UGB13131 - U2AT4M0 - UM34PX000000002

Air Data/Inertial Reference System (ADIRS) & STANDBY INSTRUMENTS

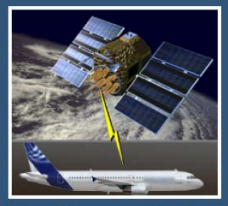
ADIRS & Digital Distance and Radio Magnetic Indicator (DDRMI)

STANDBY INSTRUMENTS

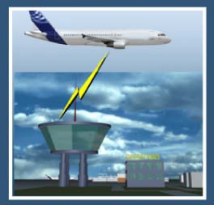
STANDBY INSTRUMENTS

OPTION

DEPENDENT POSITION DETERMINING SYSTEMS

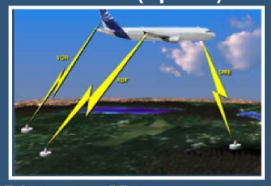


Global Positioning System (GPS)



Air Traffic Control (ATC)

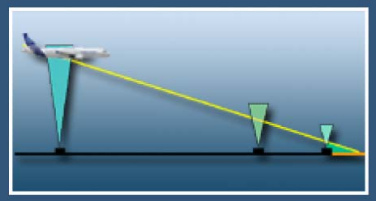
Traffic Collision Avoidance System (TCAS) / T2CAS (option)



Distance Measurement Equipment (DME)
Automatic Direction Finder (ADF)
VHF Omnidirectional Range (VOR)

LANDING AIDS

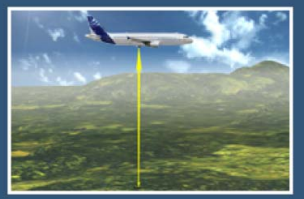
Instrument Landing System (ILS)



MARKER

INDEPENDENT POSITION DETERMINING SYSTEMS

Enhanced Ground Proximity Warning System (EGPWS) / T2CAS (option)



Radio Altimeter (RA)

Weather Radar (WXR) & Predictive Windshear (PWS)

T2CAS: Traffic and Terrain Collision Avoidance System

SUMMARY

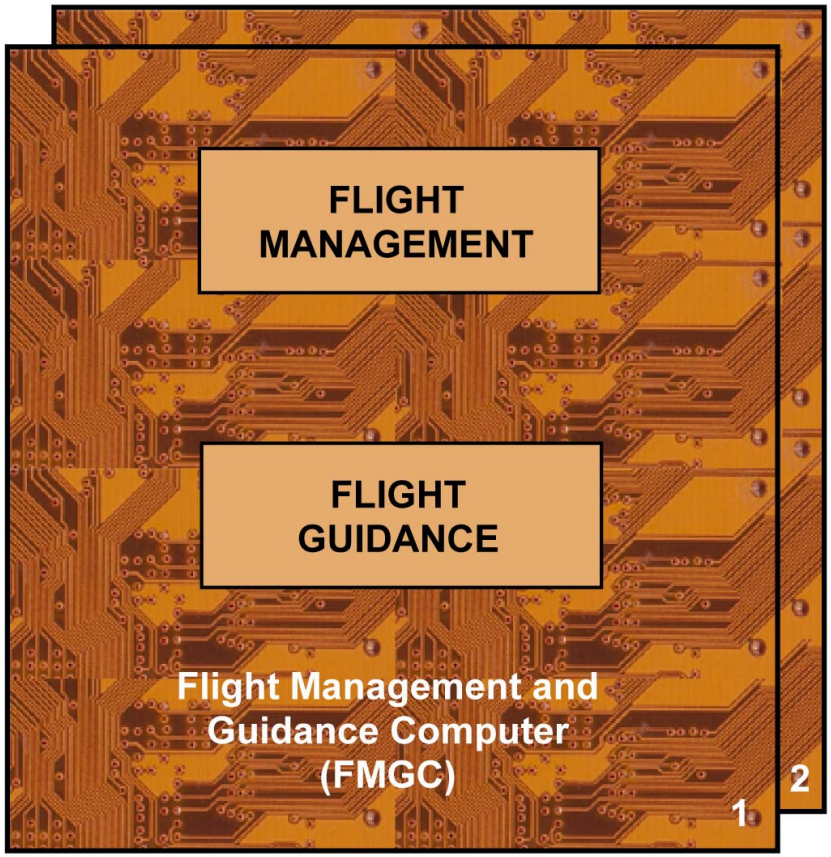
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

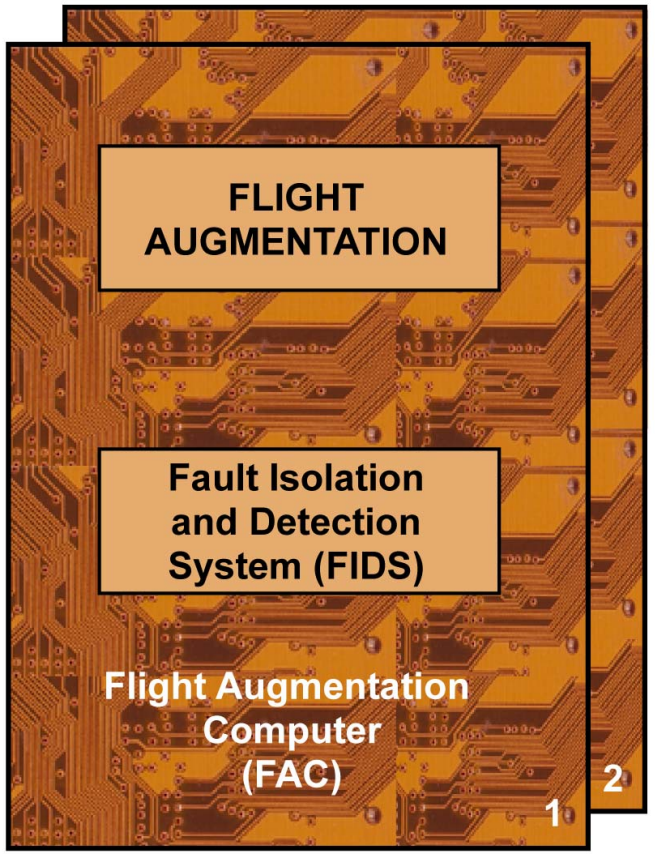
GENERAL

The Auto Flight System (AFS) is divided into four main parts:
- Flight Management (FM),
- Flight Guidance (FG),
- Flight Augmentation,
- Fault Isolation and Detection System (FIDS).

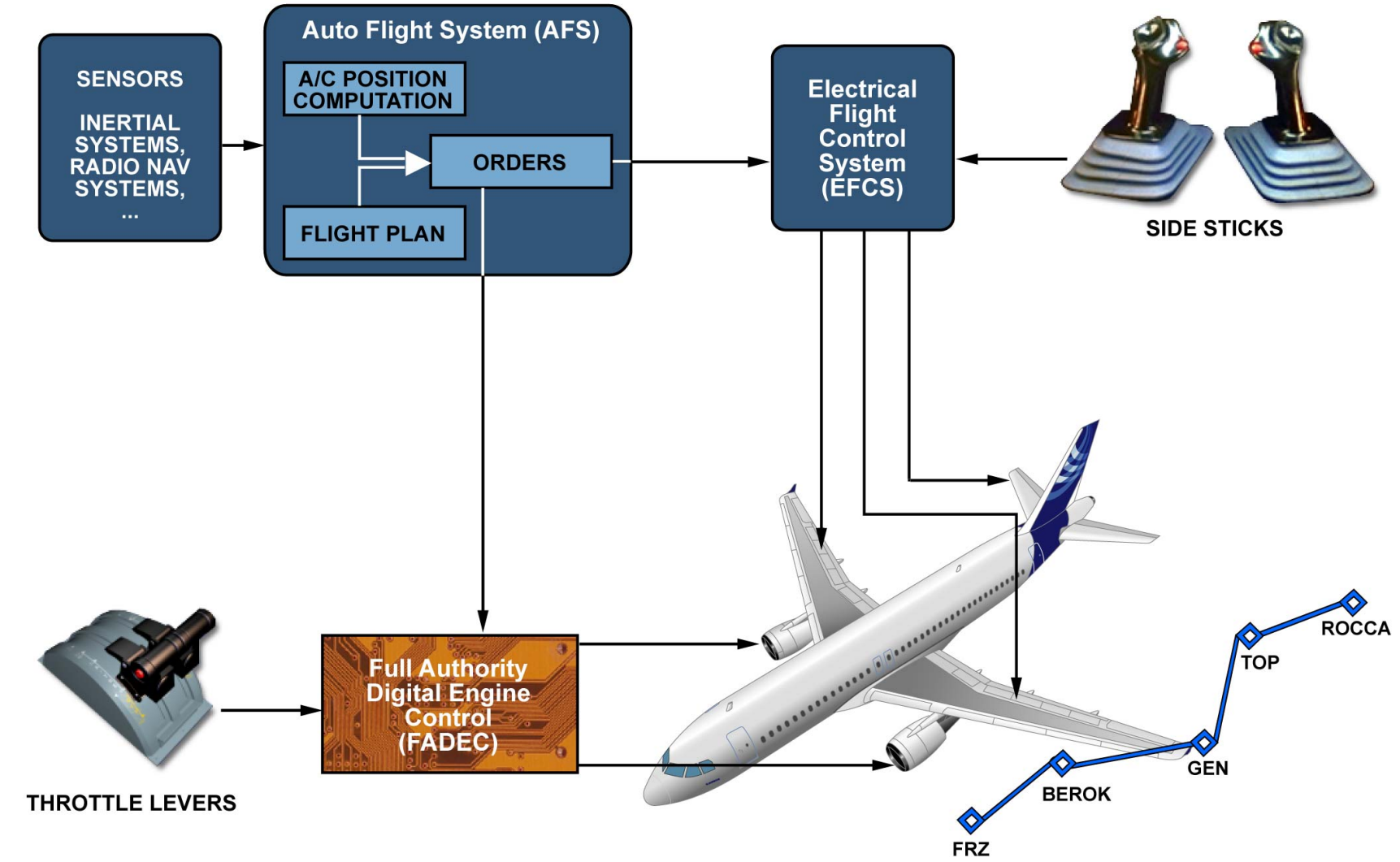
The first two functions are accomplished by the Flight Management and Guidance Computers (FMGCs). The other two functions are accomplished by the Flight Augmentation Computers (FACs).
The AFS calculates the position of the aircraft using several aircraft sensors.
In addition, the system has the capability of storing flight plans in its memory, which are predetermined by the airline. A flight plan describes a complete flight from departure to arrival, it includes vertical information and all intermediate waypoints. Knowing the position of the aircraft and the desired flight plan (chosen by the pilot), the AFS is able to compute the orders sent to the flight controls and engines so that the aircraft can follow the flight plan.

UGB13131 - U2AT4M0 - UM22PZ00000001


FLIGHT
MANAGEMENT
FLIGHT
GUIDANCE
Flight Management and
Guidance Computer
(FMGC)
1
2


FLIGHT
AUGMENTATION
Fault Isolation
and Detection
System (FIDS)
Flight Augmentation
Computer
(FAC)
1
2

GENERAL


SENSORS
INERTIAL SYSTEMS, RADIO NAV SYSTEMS, ...
Auto Flight System (AFS)
A/C POSITION COMPUTATION
ORDERS
FLIGHT PLAN
Electrical Flight Control System (EFCS)
SIDE STICKS
THROTTLE LEVERS
Full Authority Digital Engine Control (FADEC)
ROCCA
TOP
GEN
BEROK
FRZ

GENERAL

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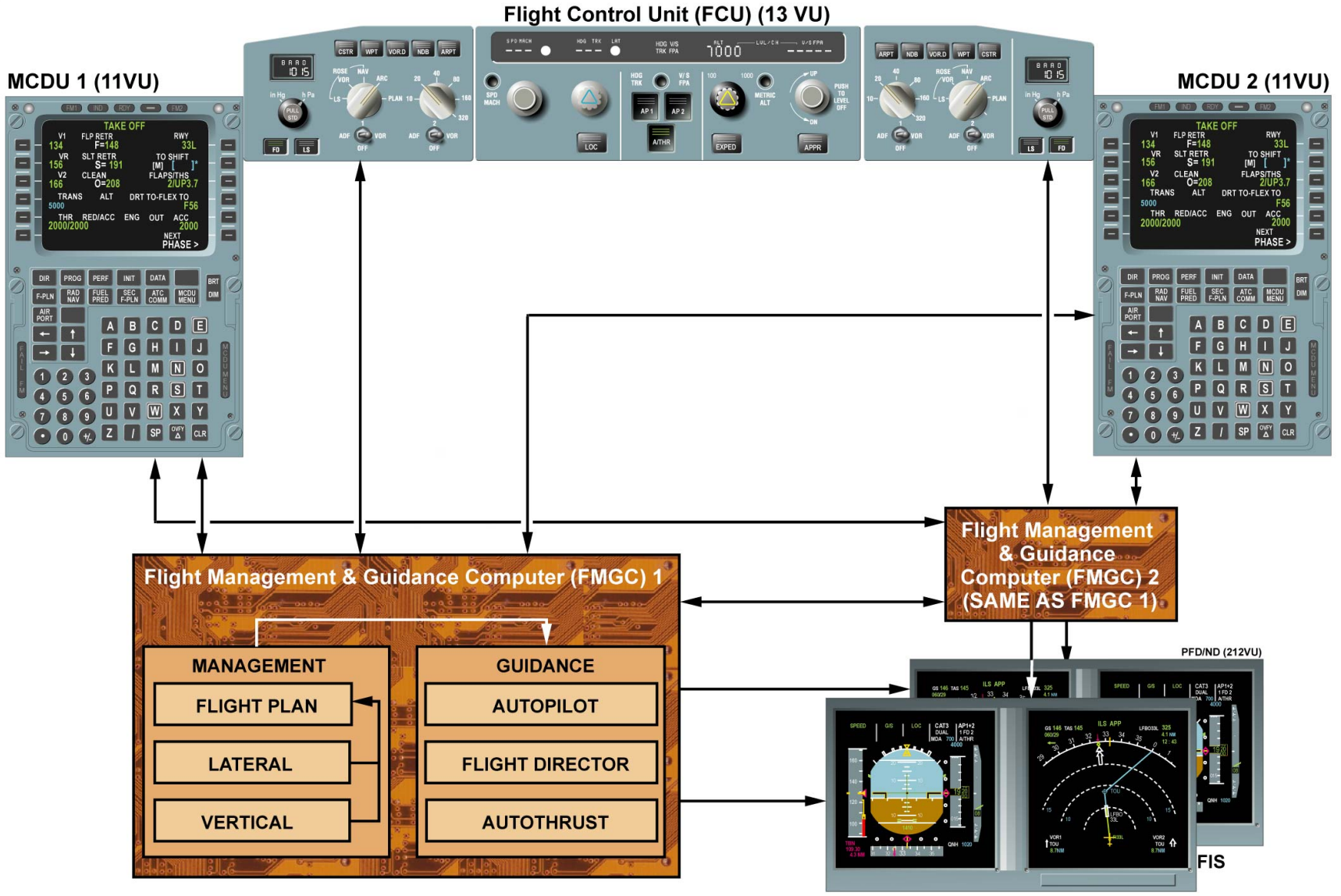
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT MANAGEMENT/FLIGHT GUIDANCE

The FM part has several functions linked to the flight plan such as lateral and vertical guidance associated with performance computation.
The FG part has 3 functions:
- Autopilot (AP),
- Flight Director (FD),
- Autothrust (A/THR).

The FMGC functions, FM and FG are controlled from the MCDUs and the Flight Control Unit (FCU).
Basically, the MCDUs provide the long term interface between the crew and the FMGCs (e.g. flight plan selection and modification) while the FCU provides the short term interface (e.g. engagement of the autopilot, flight director and A/THR functions).
Besides the MCDUs and the FCU, the main displays presenting Flight Management and Guidance information are the EFIS displays.

UGB13131 - U2AT4M0 - UM22PZ00000001



FLIGHT MANAGEMENT/FLIGHT GUIDANCE

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT MANAGEMENT/FLIGHT GUIDANCE (continued)

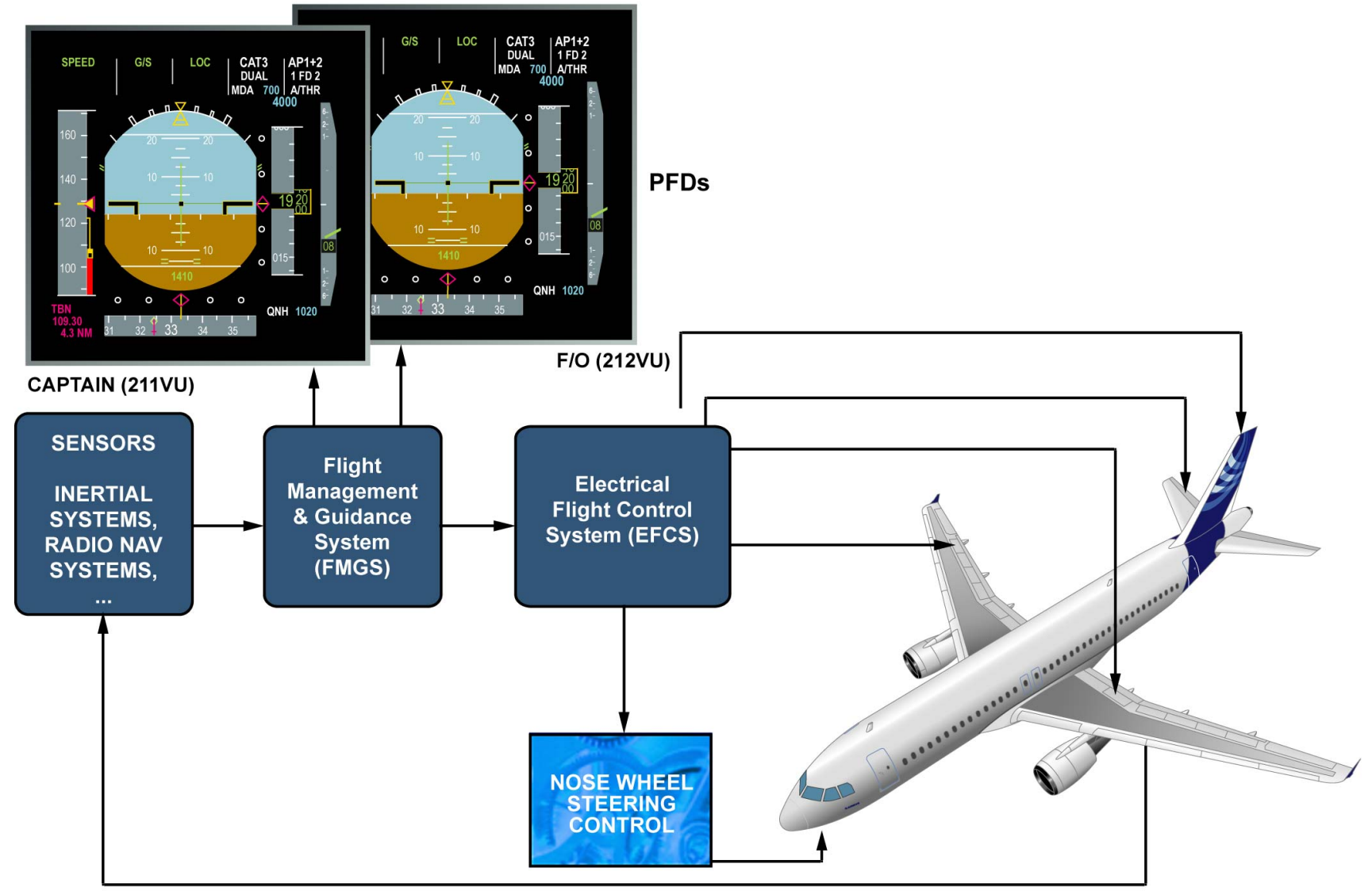
AUTOPILOT/FLIGHT DIRECTOR

The main AP and FD functions are:
- stabilization of the aircraft around its center of gravity when the AP/FD system holds vertical speed or flight path angle and heading or track,
- acquisition and holding of a flight path,
- guidance of the aircraft after take off,
- automatic landing and go around.

The AP function gives orders to control:
- the position of the control surfaces on the three axes (pitch, roll and yaw),
- the nose wheel steering.

The FD function generates optimum guidance orders used in manual controls. The FD is also used to monitor the AP when it is engaged.
The FD symbols are displayed on the PFDs.

UGB13131 - U2AT4M0 - UM22PZ000000001



FLIGHT MANAGEMENT/FLIGHT GUIDANCE - AUTOPILOT/FLIGHT DIRECTOR

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

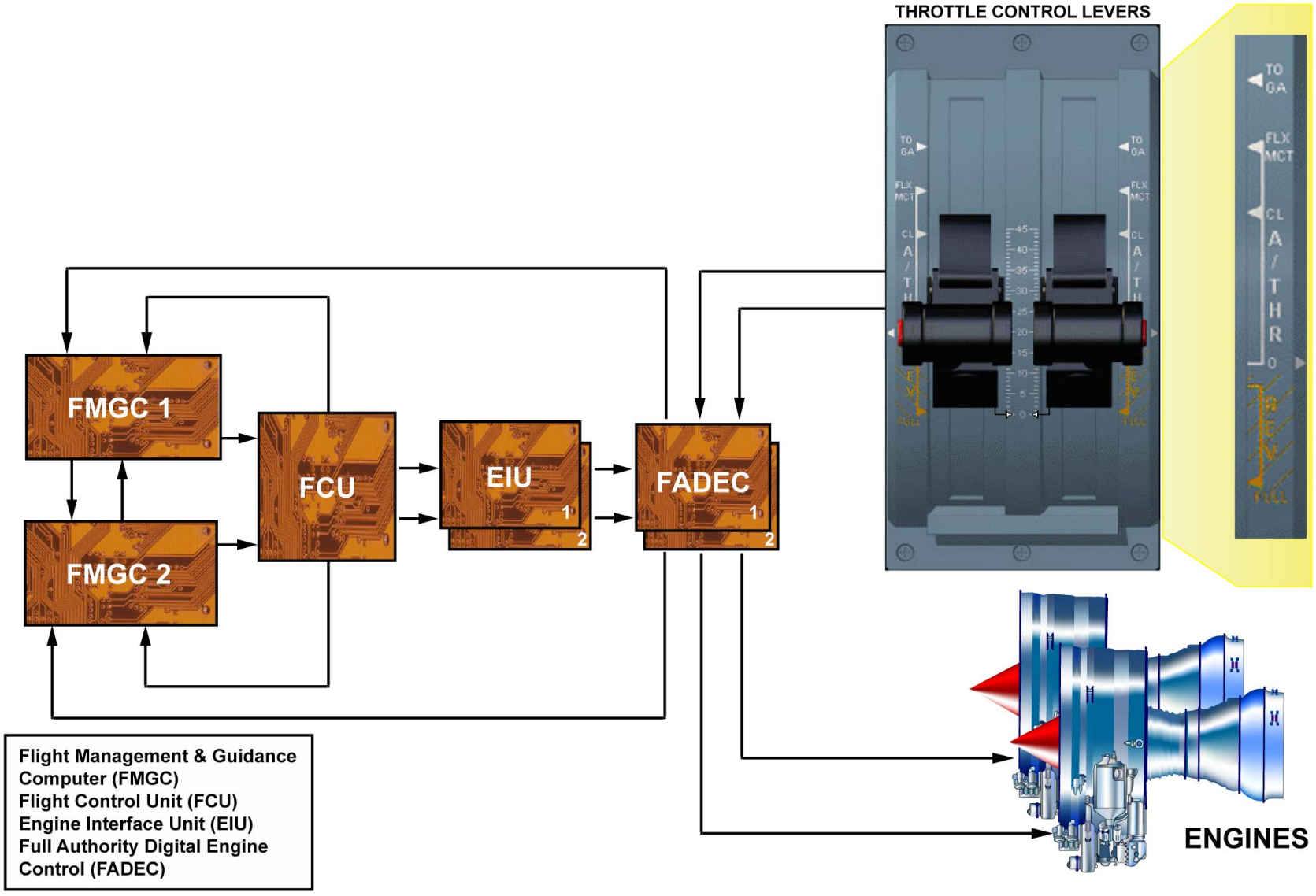
FLIGHT MANAGEMENT/FLIGHT GUIDANCE (continued)

AUTOTHRUST

The A/THR system fulfills the following functions through the control of the thrust:
- speed or mach hold (either FMGCs computed or from throttle levers position),
- thrust hold (either FMGS computed or from throttle lever position),
- thrust reduction during descent and during flare in final approach,
- protection against insufficient speed linked to excessive angle of attack.

To fulfill the A/THR functions, the FMGCs communicate with the Full Authority Digital Engine Control (FADEC) via the FCU and the Engine Interface Units (EIUs).

UGB13131 - U2AT4M0 - UM22PZ00000001



FLIGHT MANAGEMENT/FLIGHT GUIDANCE - AUTOTHRUST

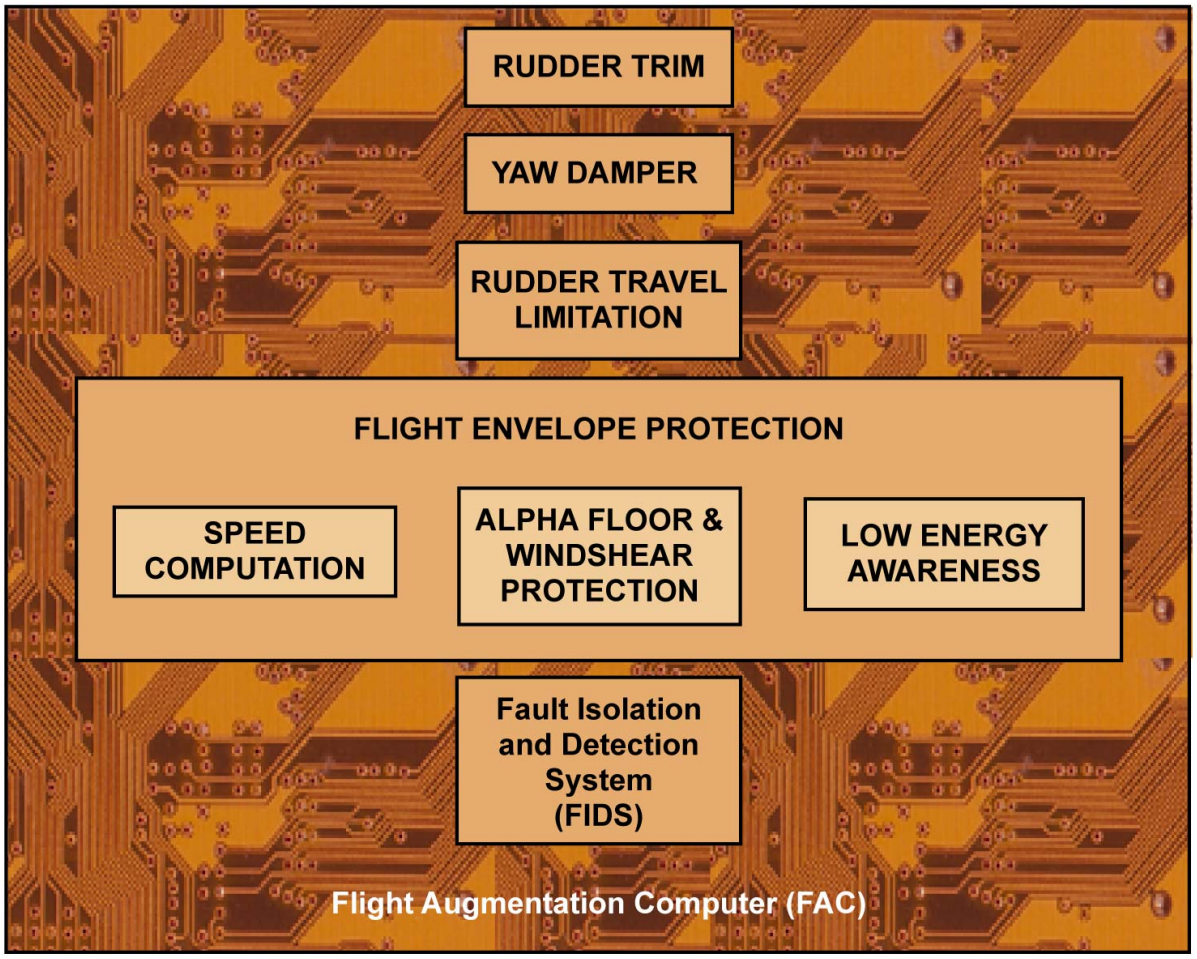
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

FLIGHT AUGMENTATION

The flight augmentation part fulfills the following functions:
- rudder trim,
- yaw damper,
- rudder travel limitation,
- flight envelope protection,
- FIDS.

For flight envelope protection, the FAC computes:
- the various speeds for aircraft operation (e.g. flaps limit speed),
- the excessive angle of attack and windshear detection,
- the low energy warning, indicating to the crew that the aircraft is quickly decelerating and that thrust will have to be increased to recover a positive flight path angle through pitch control.

The FIDS function is only active in FAC 1. FAC 1 is connected to the BITE of all the AFS computers and communicates to the Centralized Fault Display System (CFDS).



FLIGHT AUGMENTATION

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

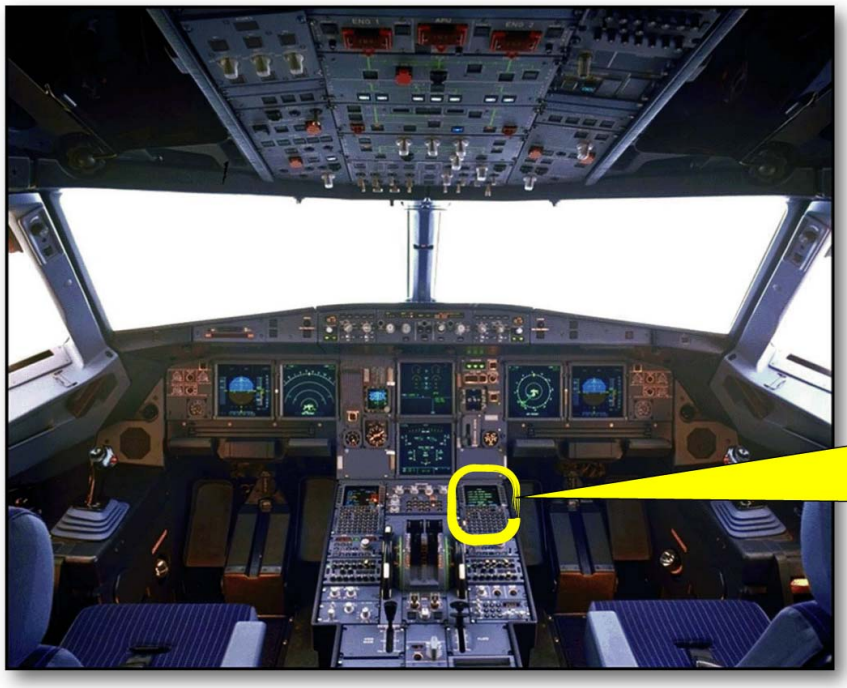
CONTROL AND INDICATING

The different components used for AFS control and indicating are described in this topic.

MCDUs

The MCDU is the primary entry/display interface between the pilot and the FM part of the FMGC. The MCDUs exchange information not directly but via the FMGCs.

UGB13131 - U2AT4M0 - UM22PZ000000001



MCDU (11VU)

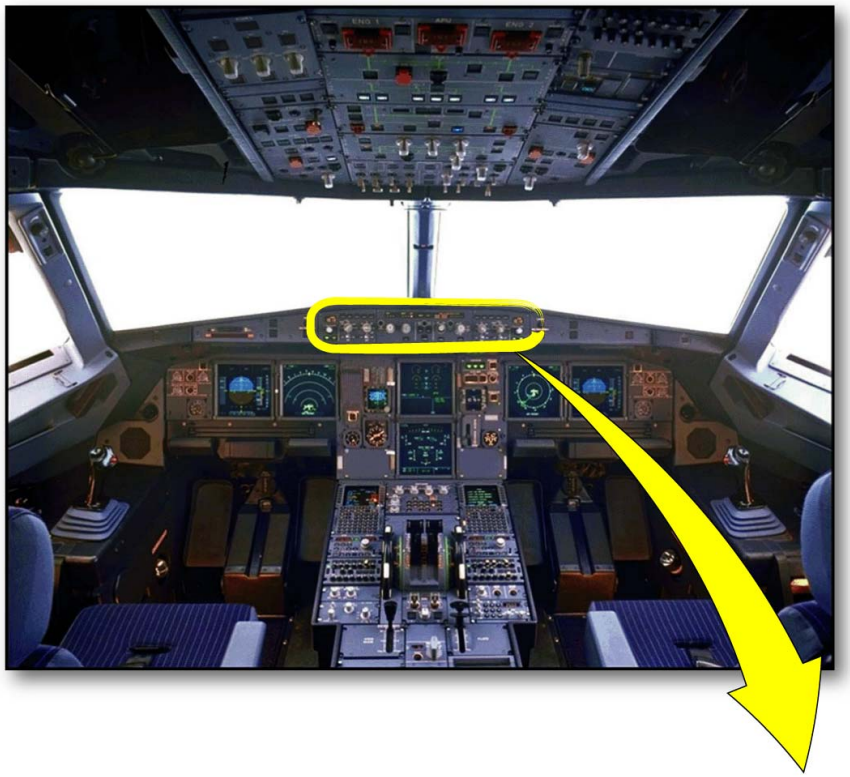
CONTROL AND INDICATING - MCDUS

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

FLIGHT CONTROL UNIT

The FCU front face includes an AFS control panel between two EFIS control panels.
The AFS control panel allows and displays the AP and A/THR engagement, and the selection of guidance modes and flight parameters.
Each pilot has an EFIS control panel to select the display on his related EFIS screens.
Speed, lateral guidance and level change can be selected by the pilot after a "pull" action or managed by the flight management after a "push" action. In that case, the parameter window shows dashes (- - - -) and a white dot will indicate that the reference is managed.
An exception to this rule is when the V/S - FPA knob is pushed, a level off is immediately commanded.



CONTROL AND INDICATING - FLIGHT CONTROL UNIT

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

EFIS DISPLAYS

Four EFIS displays, i.e. two PFDs and two NDs. Flight parameters are displayed on the PFDs while the flight plan and navigation data are displayed on the NDs.

UGB13131 - U2AT4M0 - UM22PZ00000001

CONTROL AND INDICATING - EFIS DISPLAYS

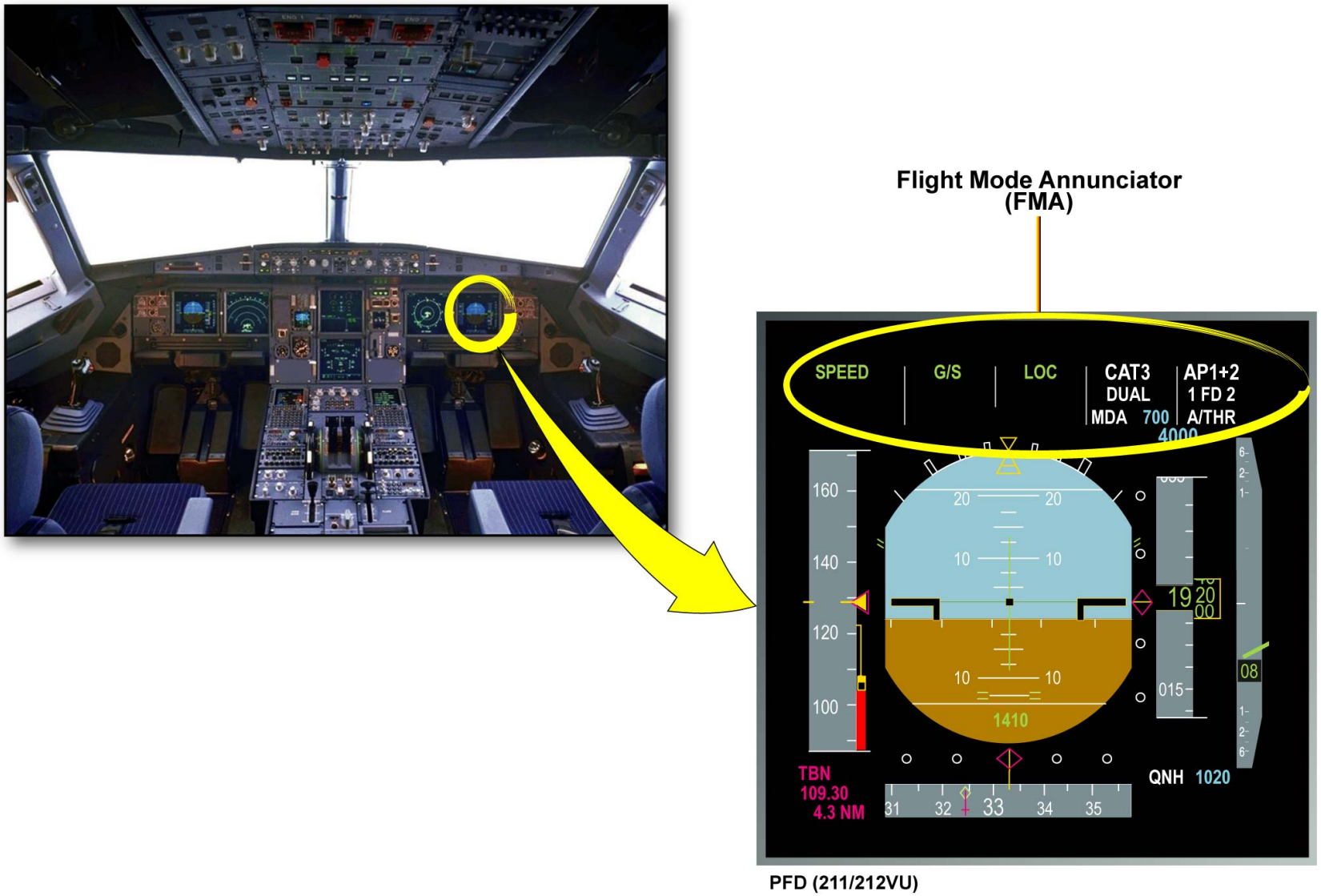
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

PRIMARY FLIGHT DISPLAY

As the main guidance instrument, the PFD displays various speeds and reference parameters used for short term flight guidance.
The Flight Mode Annunciator (FMA) is the top part of the PFD and indicates:
- the AP, FD and A/THR engagement status,
- the AP/FD and A/THR modes,
- the landing category.

UGB13131 - U2AT4M0 - UM22PZ000000001



CONTROL AND INDICATING - PRIMARY FLIGHT DISPLAY

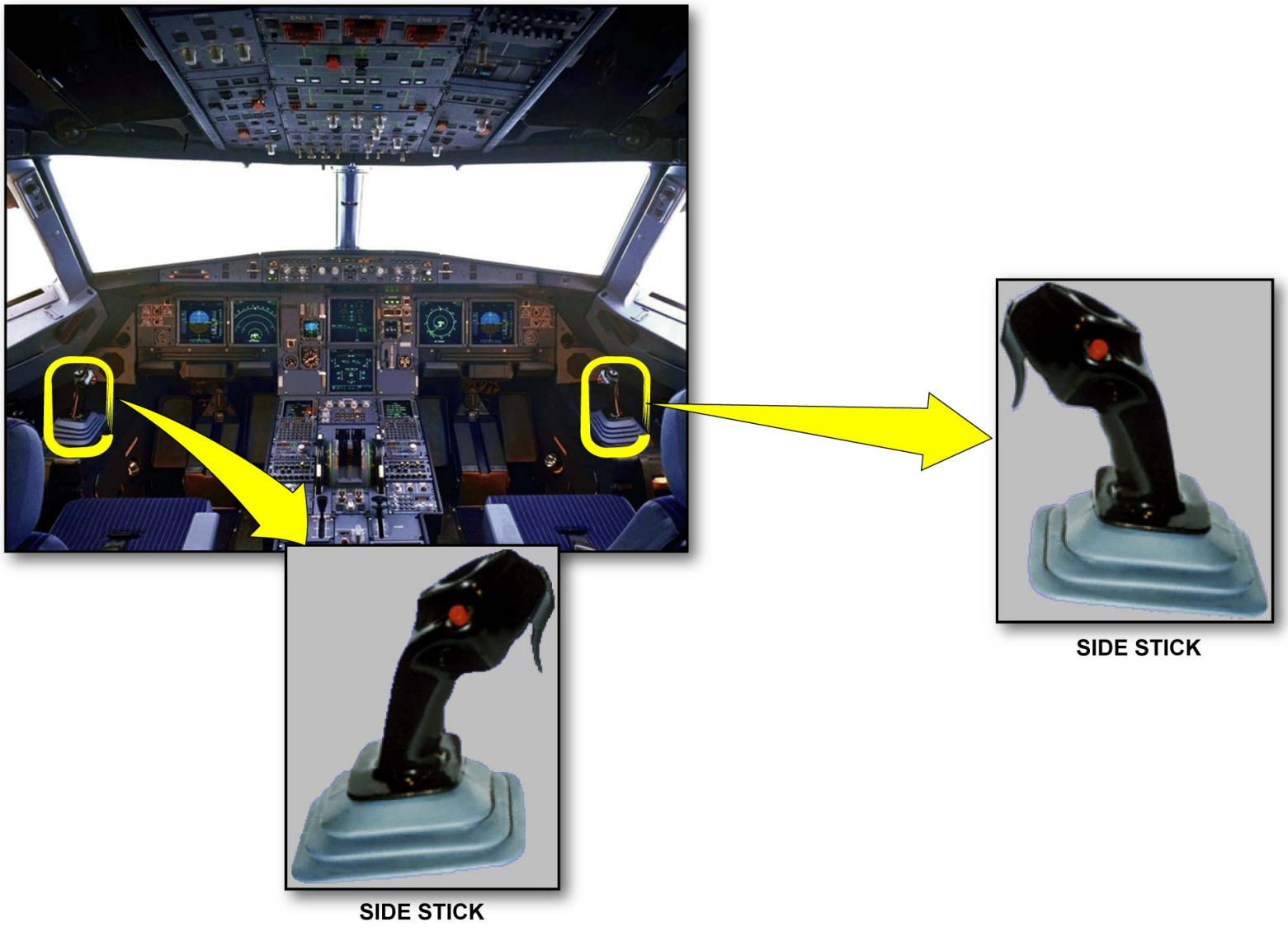
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

SIDE STICKS

When the AP is engaged, the side sticks are locked in the neutral position, by solenoids.
The AP is disengaged, and the side sticks become free, when the red TAKEOVER & PRIORITY pushbutton on any side stick is pressed or when a force above a certain threshold is applied on any side stick.

UGB13131 - U2AT4M0 - UM22PZ000000001



CONTROL AND INDICATING - SIDE STICKS

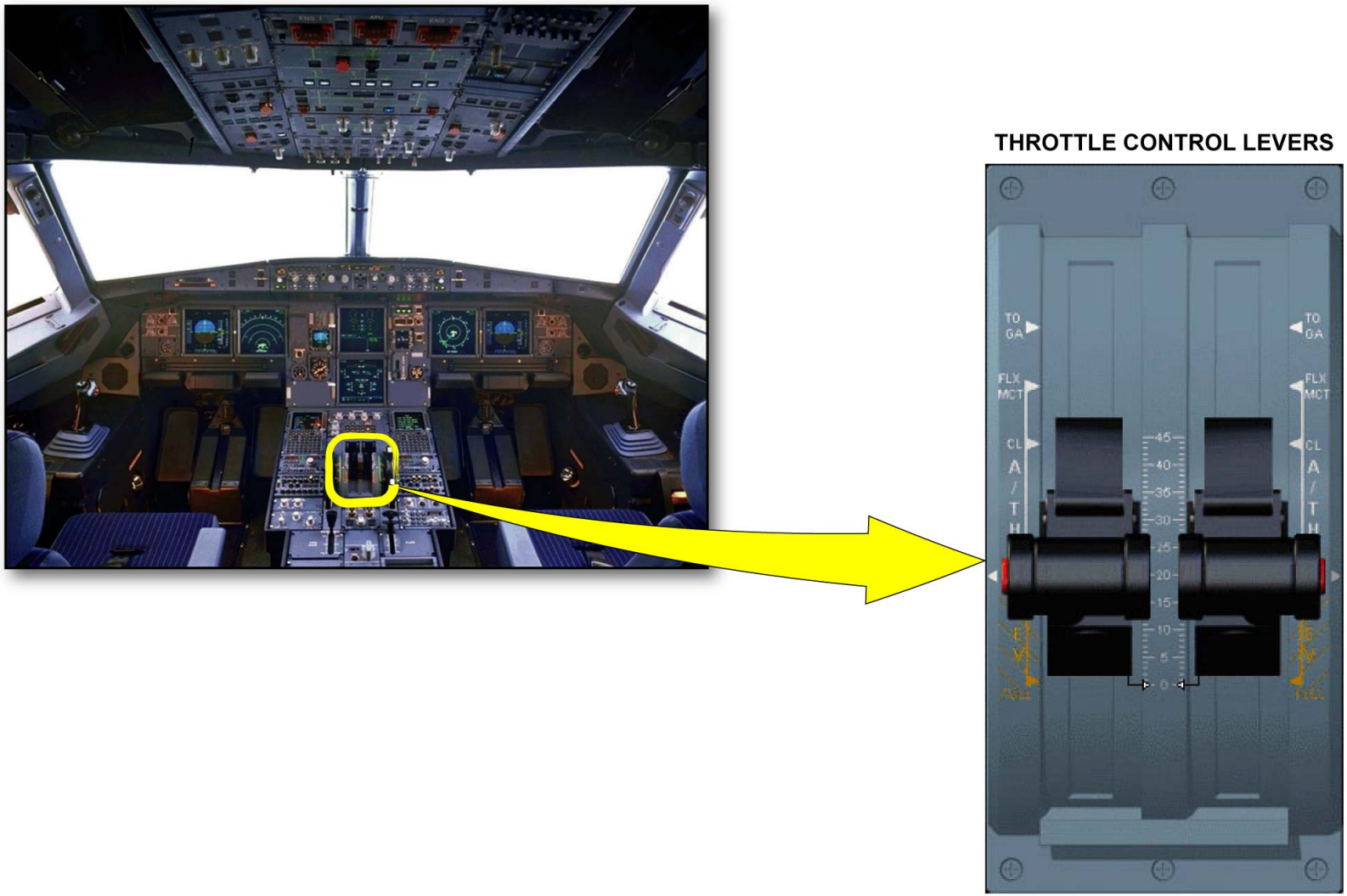
22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

THROTTLE LEVERS

The engines are manually controlled by throttle levers, which are located on the center pedestal, or automatically controlled by the A/THR system. Two red INSTINCTIVE DISCONNECT pushbuttons, located on the throttle levers, allow the A/THR function to be disengaged (push either one). Note that the throttle levers never move automatically.

UGB13131 - U2AT4M0 - UM22PZ000000001



CONTROL AND INDICATING - THROTTLE LEVERS

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

CONTROL AND INDICATING (continued)

FLIGHT CONTROL PANELS

On the two flight control (FLT CTL) panels, installed on the overhead panel, there is a pushbutton to respectively disengage FAC 1 and 2.

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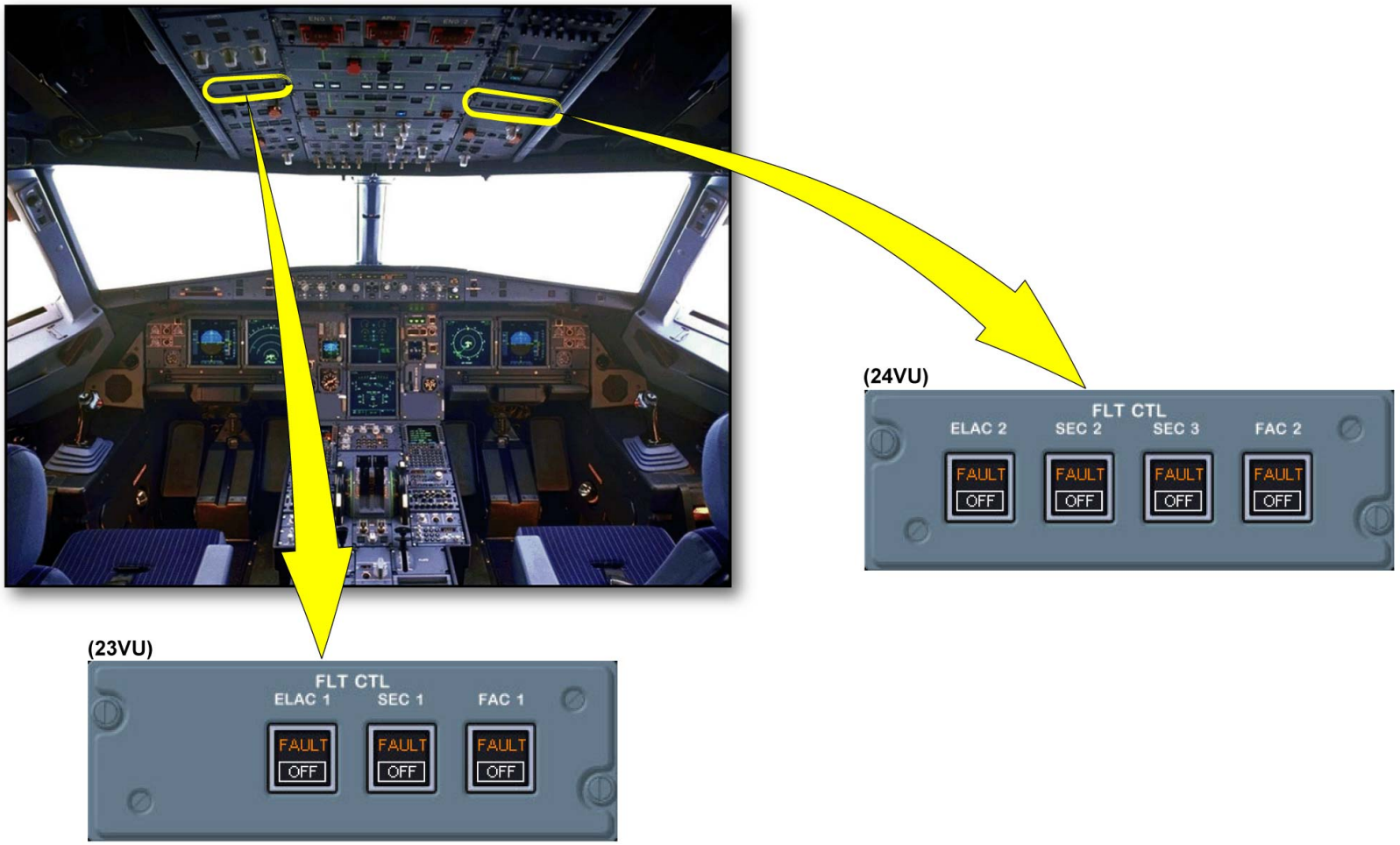


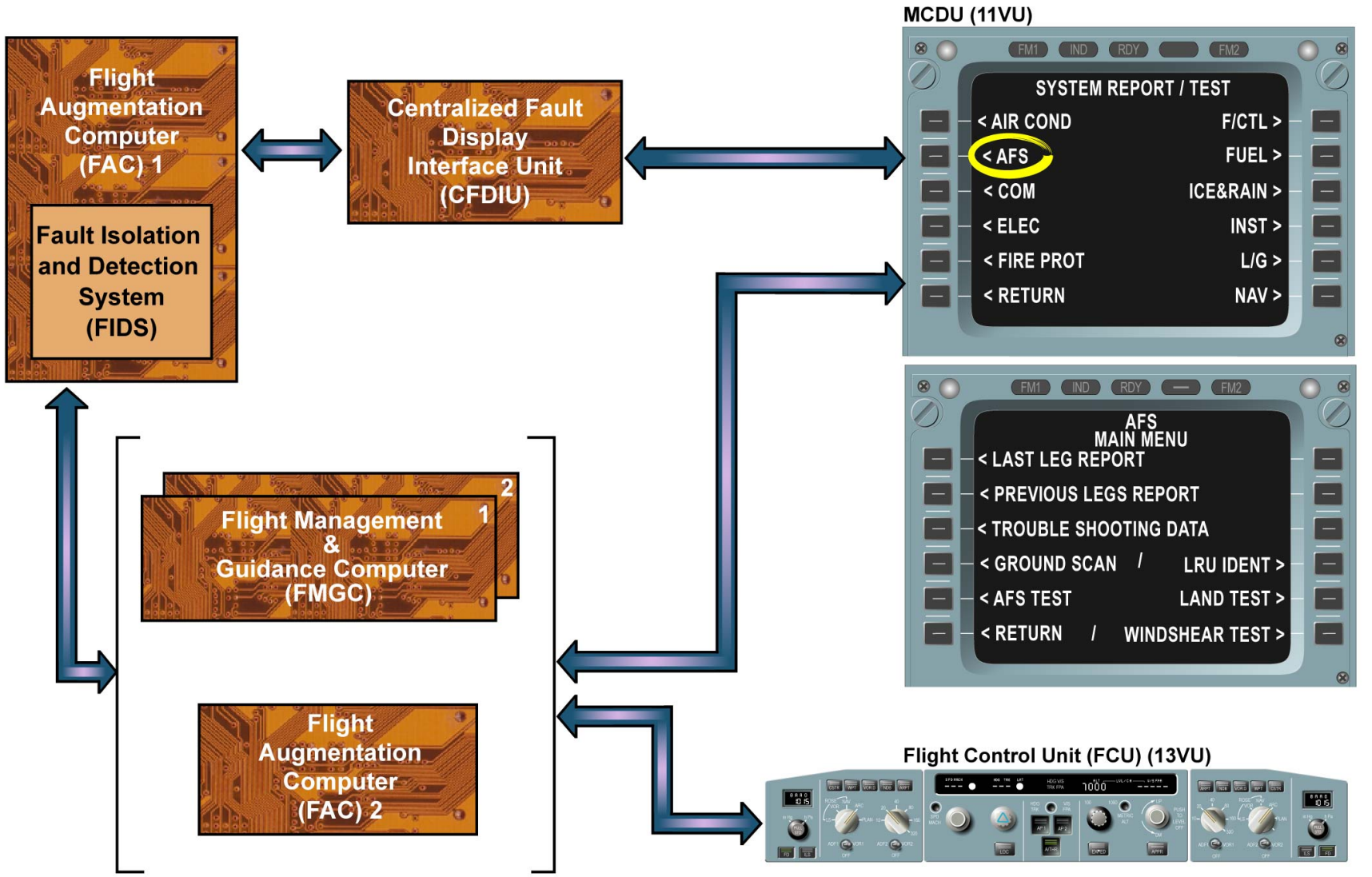
CONTROL AND INDICATING - FLIGHT CONTROL PANELS

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

Using the MCDU, you can have access to the CFDS fault messages of the AFS.
The BITE of each AFS computer including FCU and MCDUs, can be interrogated via the FAC 1. AFS TEST and LAND TEST can be launched from the MCDUs.

UGB13131 - U2AT4M0 - UM22PZ00000001



MAINTENANCE/TEST FACILITIES

22 AUTO FLIGHT SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

Make sure that all circuits in maintenance are isolated before you apply electrical power to the aircraft.
Before you pressurize/depressurize a hydraulic system:
- make sure that the travel ranges of the flight control surfaces are clear,
- check that the Flap/Slat lever agrees with the actual flap and slat surface position,
- make sure that the Speed brake Selector is retracted and disarmed.

Put safety devices and warning notices before you start a task on or near:
- the flight controls,
- the flight control surfaces,
- the landing gear and the related doors,
- components that move.

Put warning notices in the cockpit to identify systems undergoing maintenance work.

WARNING
OBEY ALL THE AMM SAFETY PROCEDURES.
AMM
DANGER
PUT SAFETY DEVICES AND WARNING NOTICES BEFORE YOU START A TASK.
WARNING
MAKE SURE THAT THE TRAVEL RANGES OF THE FLIGHT CONTROL SURFACES ARE CLEAR.
WARNING
MAKE SURE THAT THE FLAP/SLAT LEVER AGREES WITH THE ACTUAL FLAP AND SLAT SURFACE POSITION AND CHECK THAT THE SPEED BRAKE SELECTOR IS RETRACTED AND DISARMED.
PARK BRK

SAFETY PRECAUTIONS

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

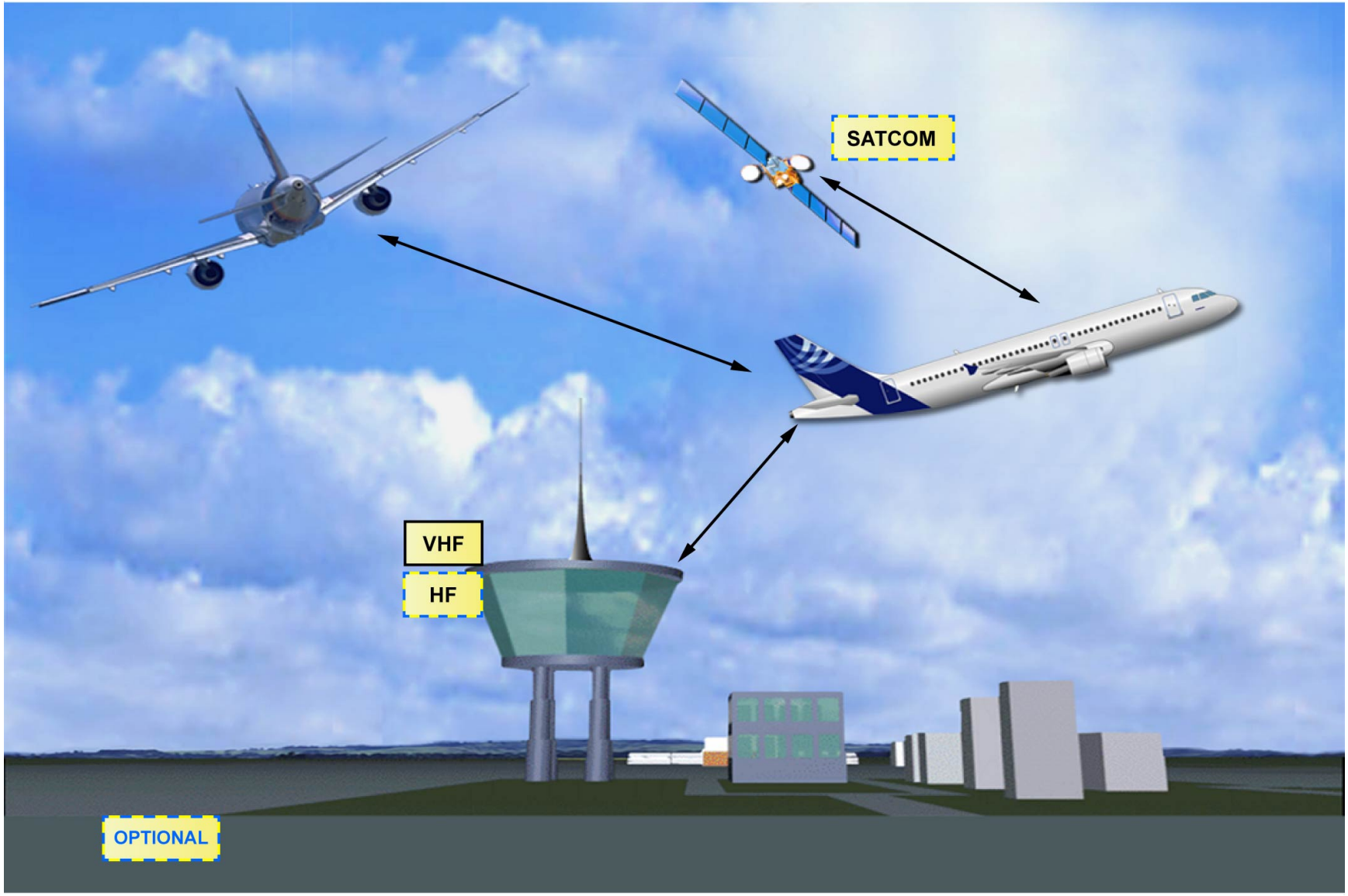
GENERAL

The single aisle aircraft communication system has two sub-systems:
- radio communication,
- on-board communication.

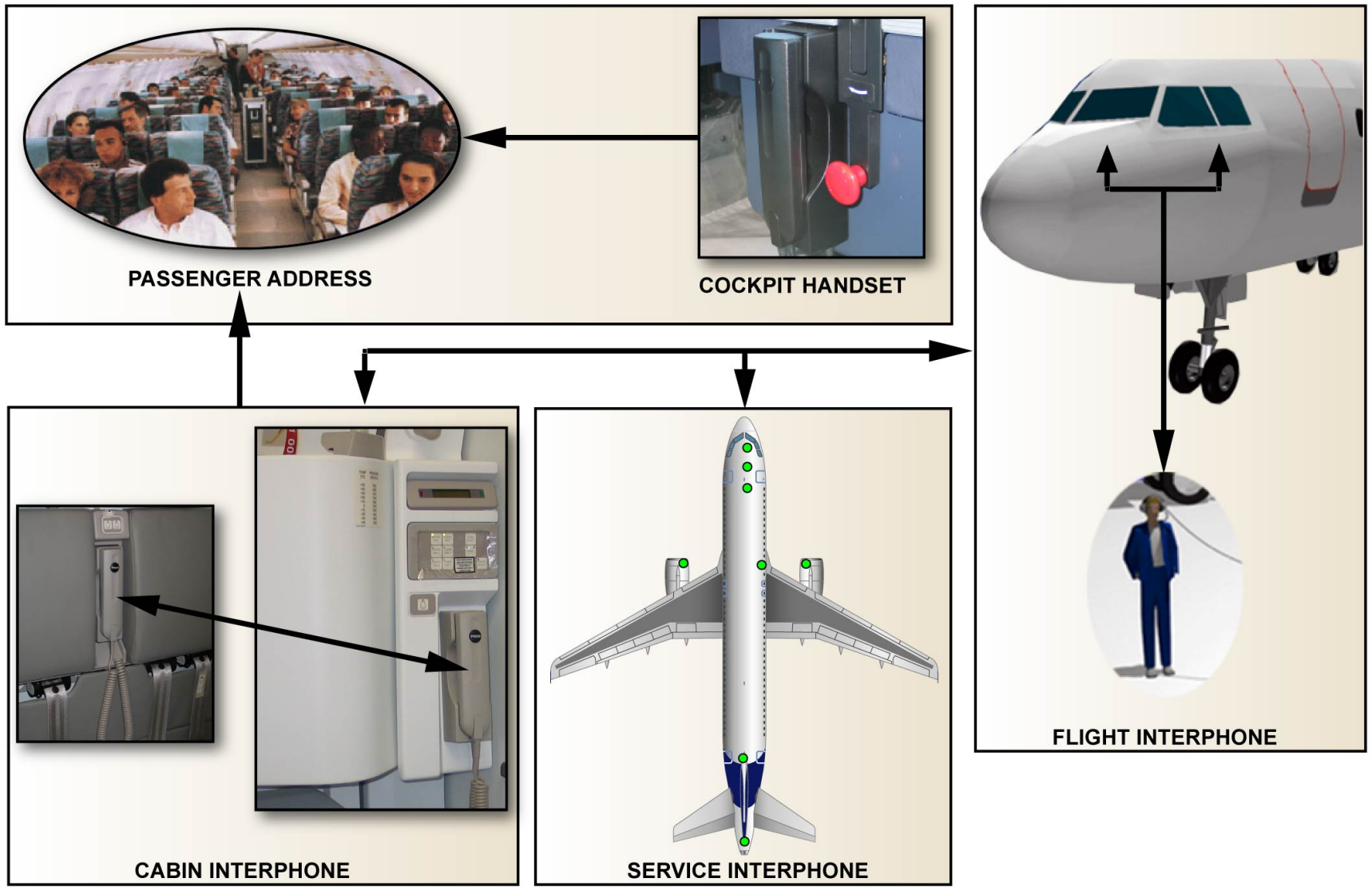
The radio communication systems are used for communications to and from the aircraft.

The on-board internal communication system is divided into 4 functions:
- Service interphone (on ground only) for maintenance technician communication with cockpit or cabin thanks to several jack connectors around the A/C,
- Flight interphone for cockpit internal communication and also with the ground mechanic,
- Passenger Address (PA) from the cockpit or from cabin crew stations for passenger announcements,
- Cabin interphone for cabin crew or cabin crew/pilots communication.

UGB13131 - U2AT4M0 - UM23PZ00000002



GENERAL


PASSENGER ADDRESS
COCKPIT HANDSET
FLIGHT INTERPHONE
CABIN INTERPHONE
SERVICE INTERPHONE

GENERAL

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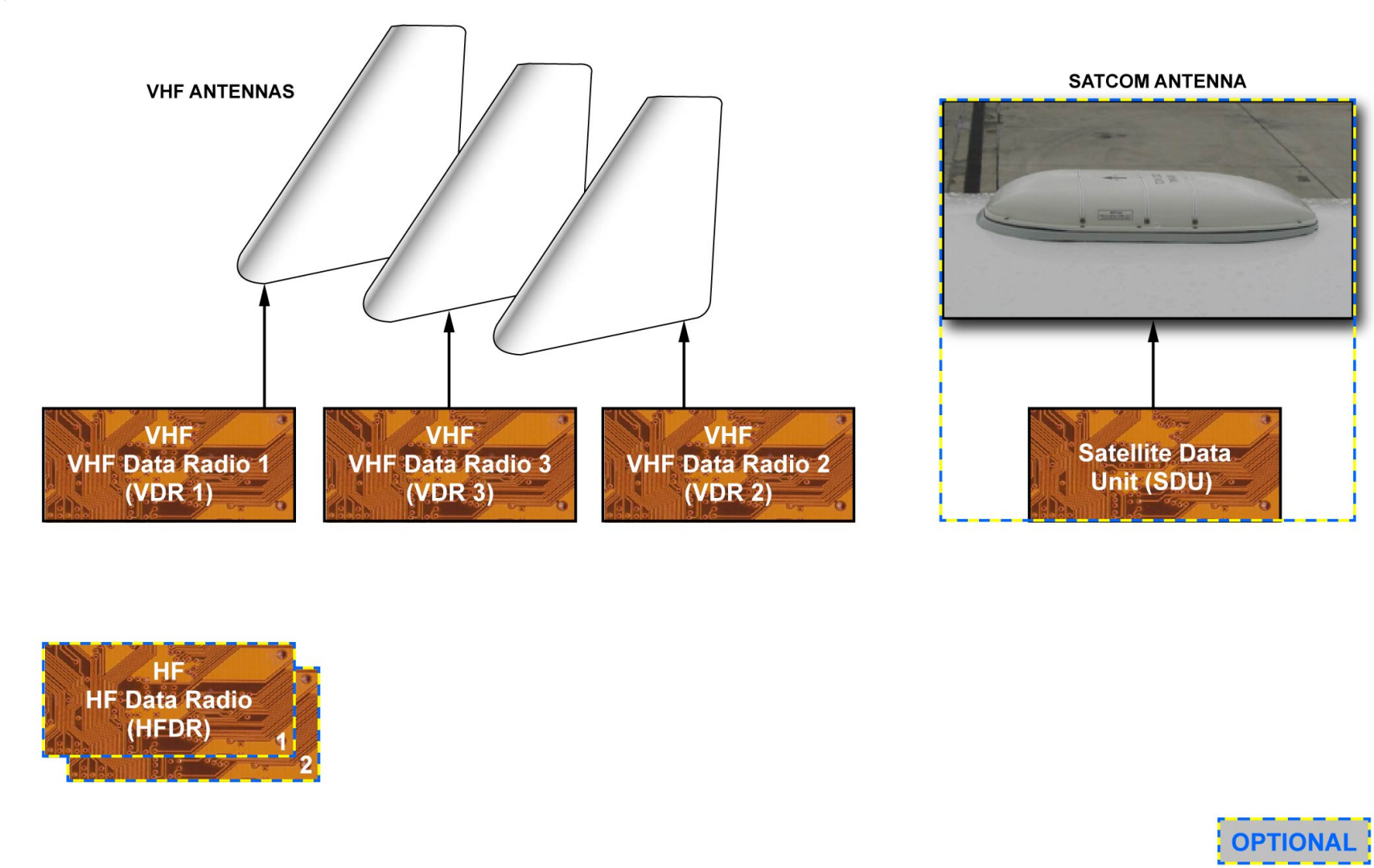
UGB13131 - U2AT4M0 - UM23PZ00000002

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

RADIO COMMUNICATION SYSTEM

The radio communications system lets the crew communicate with ground stations and to other aircrafts through VHF Data Radio (VDR), High Frequency Data Radio (HFDR) and SATCOM if installed.
The VHF transceivers are identical and interchangeable, as are the HF transceivers. VDR 1 and VDR 2 are normally used by the flight crew for voice communications. VDR 3 is used for Air Traffic Service Unit (ATSU) functions, and is used as back-up voice communications in case of system 1 or 2 failure.
The HF transceivers are used when the aircraft is beyond the useful range of the VHF radios.
The SATellite COMmunication system (SATCOM) is composed of the Satellite Data Unit (SDU),
The SATCOM is a multi channel aviation satellite communication system. It supplies worldwide mobile radio communications that can handle voice and data.

UGB13131 - U2AT4M0 - UM23PZ00000002



RADIO COMMUNICATION SYSTEM

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

RADIO COMMUNICATIONS CONTROL AND INDICATING

RMP

The Radio Management Panels (RMPs) give the capability of tuning all communication radios. The frequencies are tuned by using the 2 concentric knobs.
Any RMP can tune any communication radio but each one is normally dedicated to a particular radio.
- RMP 1 is dedicated to VDR 1,
- RMP 2 is dedicated to VDR 2,
- RMP 3 is dedicated to VDR 3 and HF 1/HF 2 (if installed).

UGB13131 - U2AT4M0 - UM23PZ00000002

RMP (11VU)

OPTIONAL

RMP: Radio Management Panel

RADIO COMMUNICATIONS CONTROL AND INDICATING - RMP

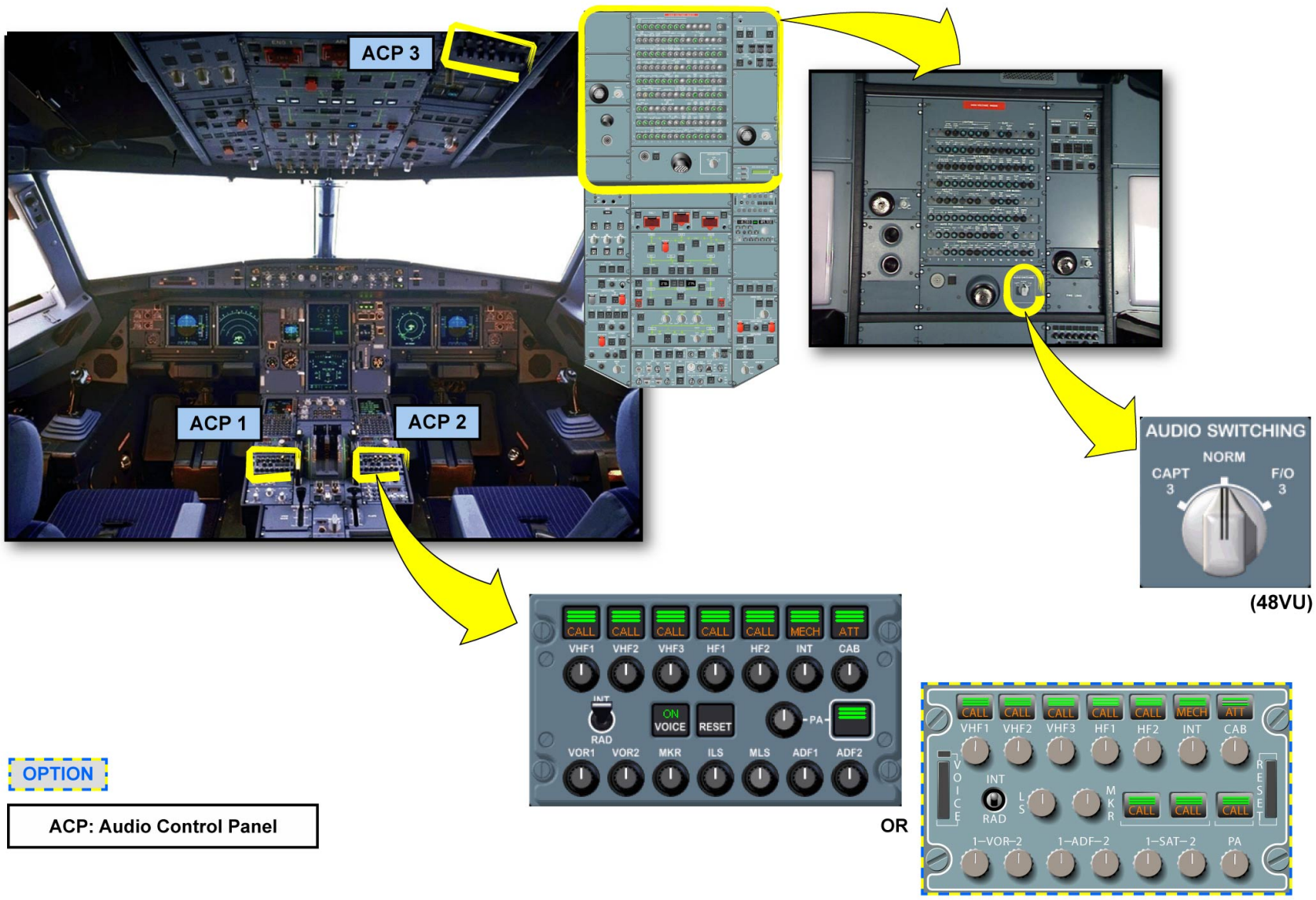
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

RADIO COMMUNICATIONS CONTROL AND INDICATING (continued)

ACP

There are three Audio Control Panels (ACPs). The ACPs allow for audio channel selection for both transmission and reception. Additionally, the ACP provides individual volume control for reception channels. ACP 1 is dedicated to the captain and ACP 2 is dedicated to the F/O. A third ACP is dedicated for a third occupant and may be used as a back up for captain or first officer in case of failure. As an option ACPs with a SATCOM function can be installed.

UGB13131 - U2AT4M0 - UM23PZ00000002



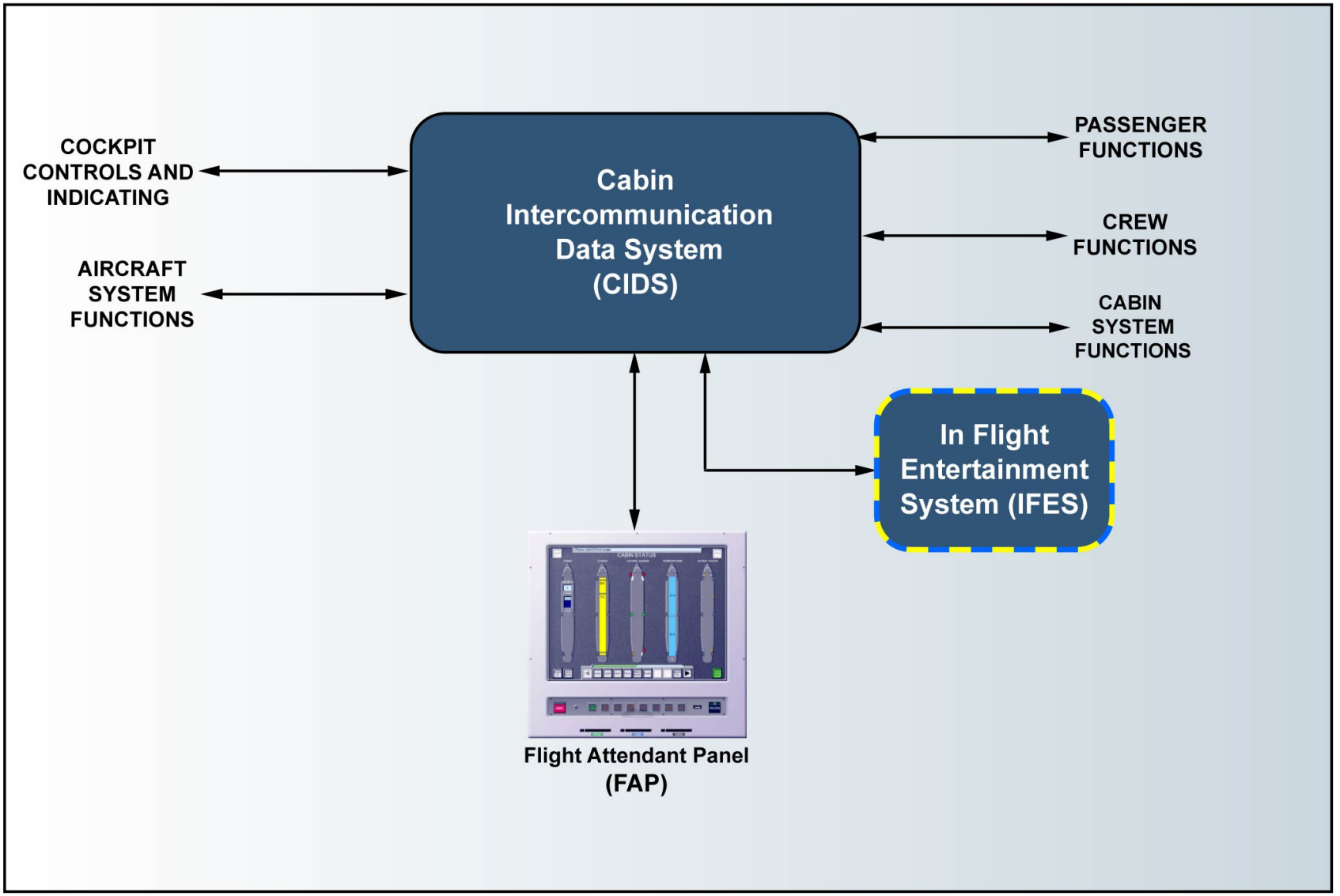
RADIO COMMUNICATIONS CONTROL AND INDICATING - ACP

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

ON-BOARD COMMUNICATIONS

Of the four on-board communication systems, two Cabin Intercommunications Data System (CIDS) directors control three of the four functions. The CIDS directors manage the following on-board communication functions:
- PA system for passenger announcements (from the cockpit or from cabin crew stations),
- cabin interphone system for crew communication (cabin together or with cockpit),
- service interphone.

The CIDS directors do not manage the flight interphone.
The cabin crew can also manage these functions, through the In Flight Entertainment System (IFES), Video Announcements (VAs) or optionally through entertainment (video and audio).



ON-BOARD COMMUNICATIONS

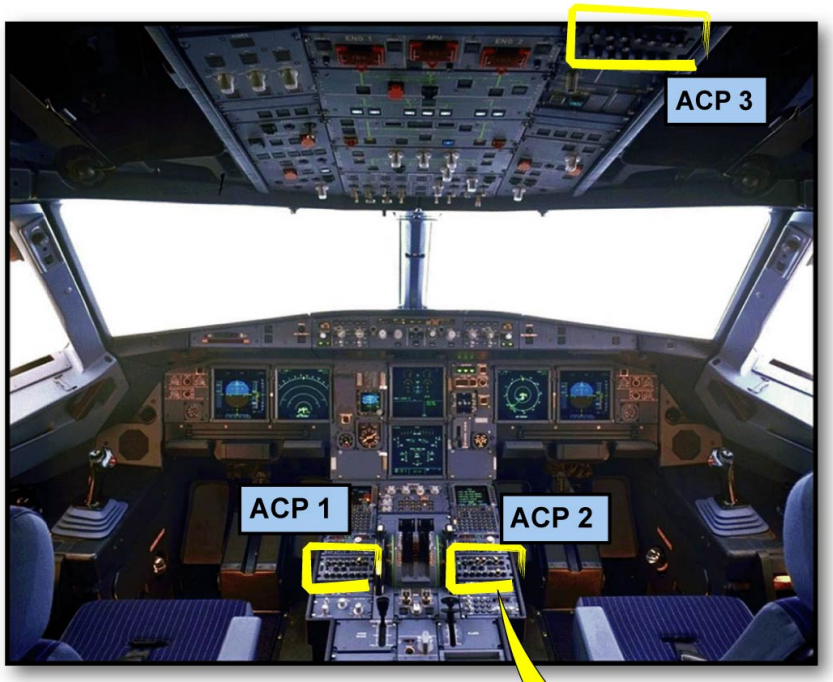
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

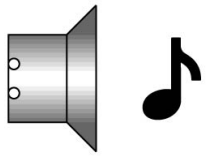
ON-BOARD COMMUNICATION CONTROL AND INDICATING

ACP

The ACPs also give to the flight crew the ability to communicate with ground personnel and cabin crew and annunciate calls to the flight deck.
Calls to the flight deck can be made from any of the cabin attendant handsets. Mechanic calls can also be made from the External Power Panel. This will cause a buzzer to sound and a CALL light to come on, on the ACPs.

UGB13131 - U2AT4M0 - UM23PZ00000002





ACP (11VU)

OR

OPTION

ACP: Audio Control Panel

ON-BOARD COMMUNICATION CONTROL AND INDICATING - ACP

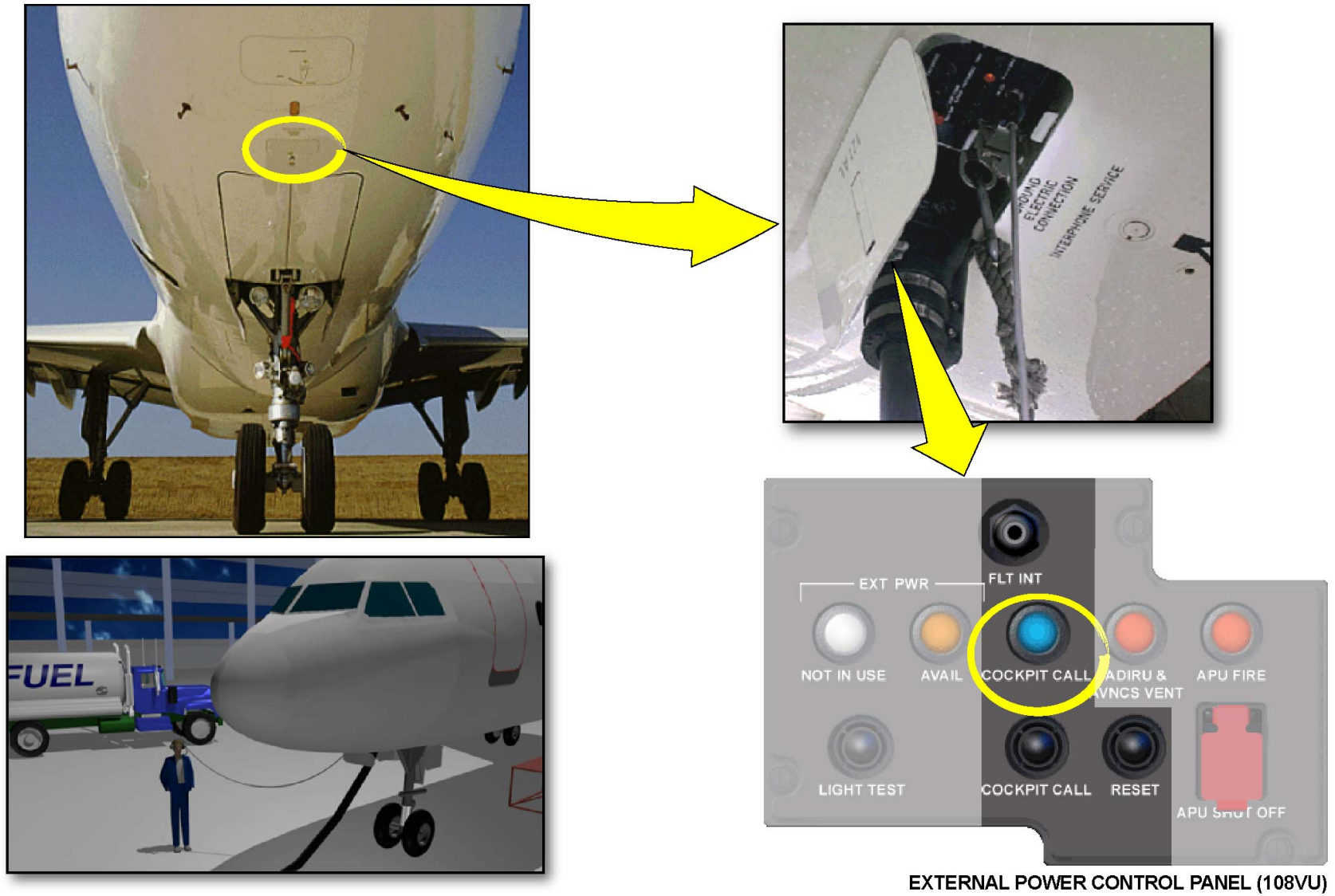
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

ON-BOARD COMMUNICATION CONTROL AND INDICATING (continued)

FLIGHT INTERPHONE

This system allows the flight crew members to communicate among themselves and with the ground mechanic.

UGB13131 - U2AT4M0 - UM23PZ00000002



EXTERNAL POWER CONTROL PANEL (108VU)

ON-BOARD COMMUNICATION CONTROL AND INDICATING - FLIGHT INTERPHONE

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

ON-BOARD COMMUNICATION CONTROL AND INDICATING (continued)

AMU

The heart of the audio system is the Audio Management Unit (AMU). It routes the signals generated by the crew and directs the signals to and from the appropriate radio or interphone system.
The AMU has a decoding unit called SELective CALling (SELCAL). It lets aural and visual indications on the ACP with an amber CALL indication to alert the flight crew for calls from ground stations. When the PA function is used from cockpit the audio signal is routed via the AMU to the CIDS director and from the director to the Decoder Encoder Units (DEUs) for distribution in the cabin.

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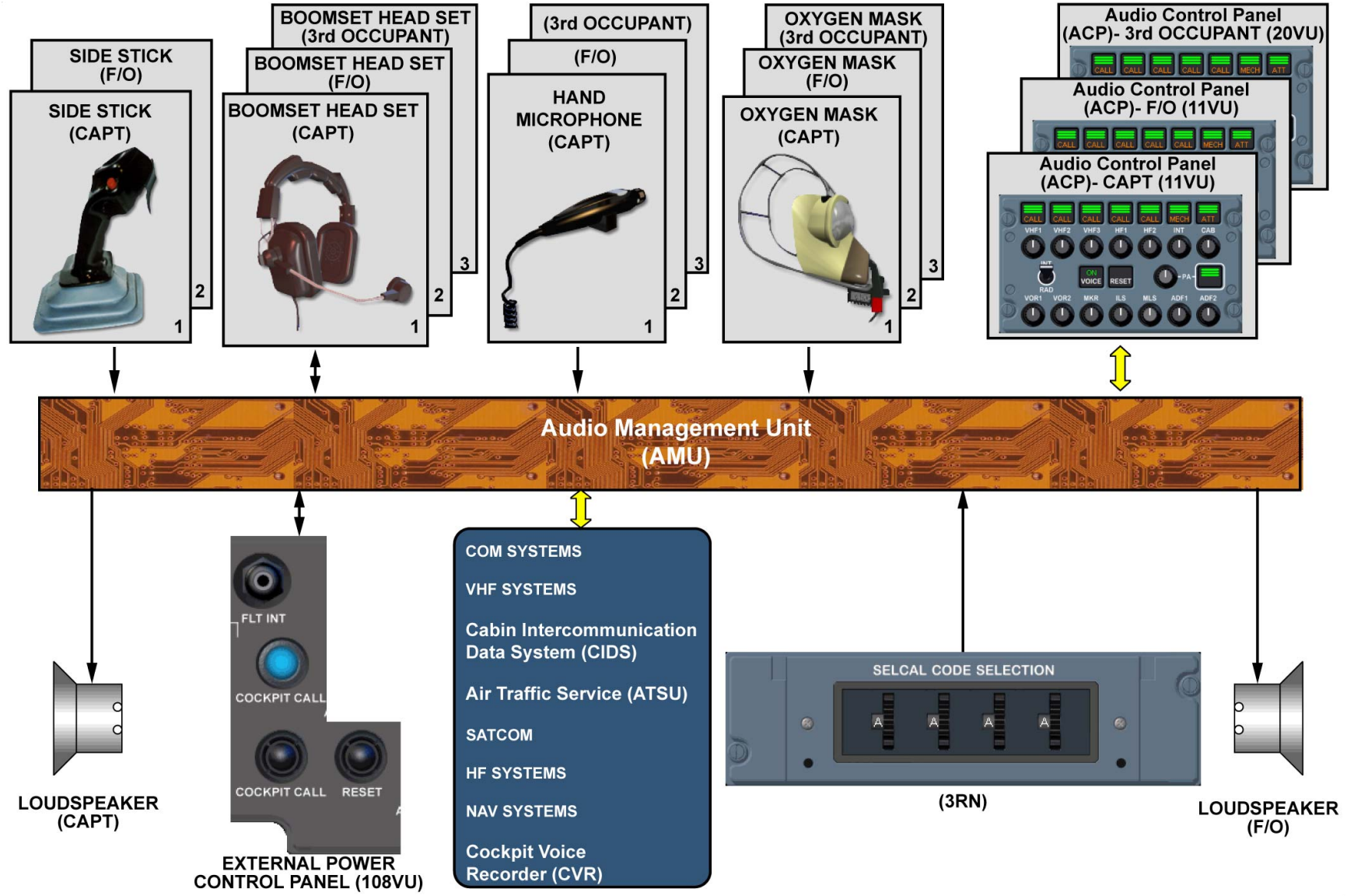


ON-BOARD COMMUNICATION CONTROL AND INDICATING - AMU

UGB13131 - U2AT4M0 - UM23PZ00000002

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

ON-BOARD COMMUNICATION CONTROL AND INDICATING (continued)

CALLS PANEL

The CALLS panel lets the cockpit crew gain the attention of a ground mechanic or the cabin crew by triggering visual and audio signals. For mechanic call the horn will sound, for cabin crew a high low chime will be broadcast on respective areas.

UGB13131 - U2AT4M0 - UM23PZ00000002

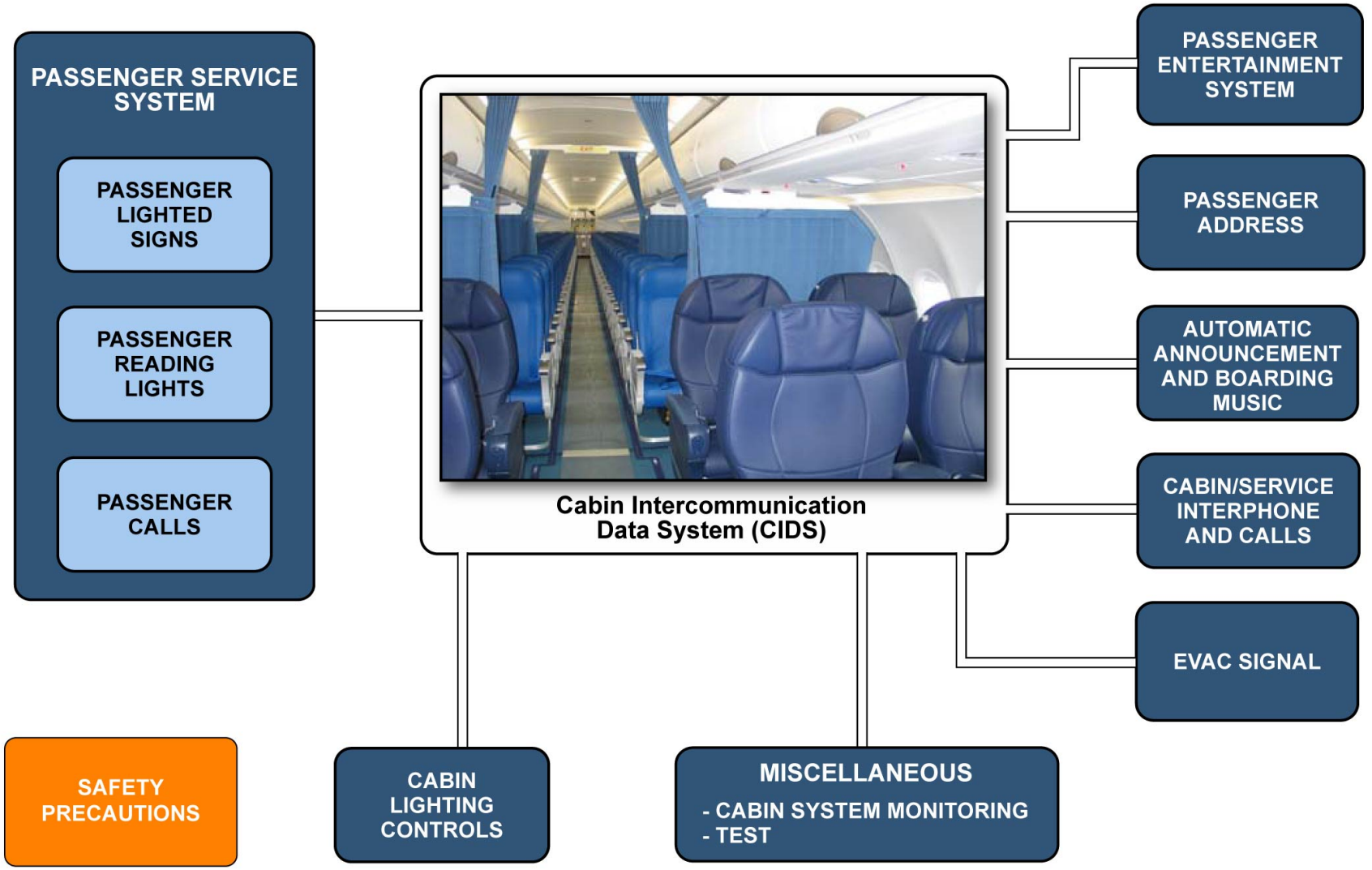
OPTIONAL

ON-BOARD COMMUNICATION CONTROL AND INDICATING - CALLS PANEL

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CABIN INTERCOMMUNICATION DATA SYSTEM

The Cabin Intercommunication Data System (CIDS) is used for the control and management of all cabin systems shown in the graphic.



CABIN INTERCOMMUNICATION DATA SYSTEM

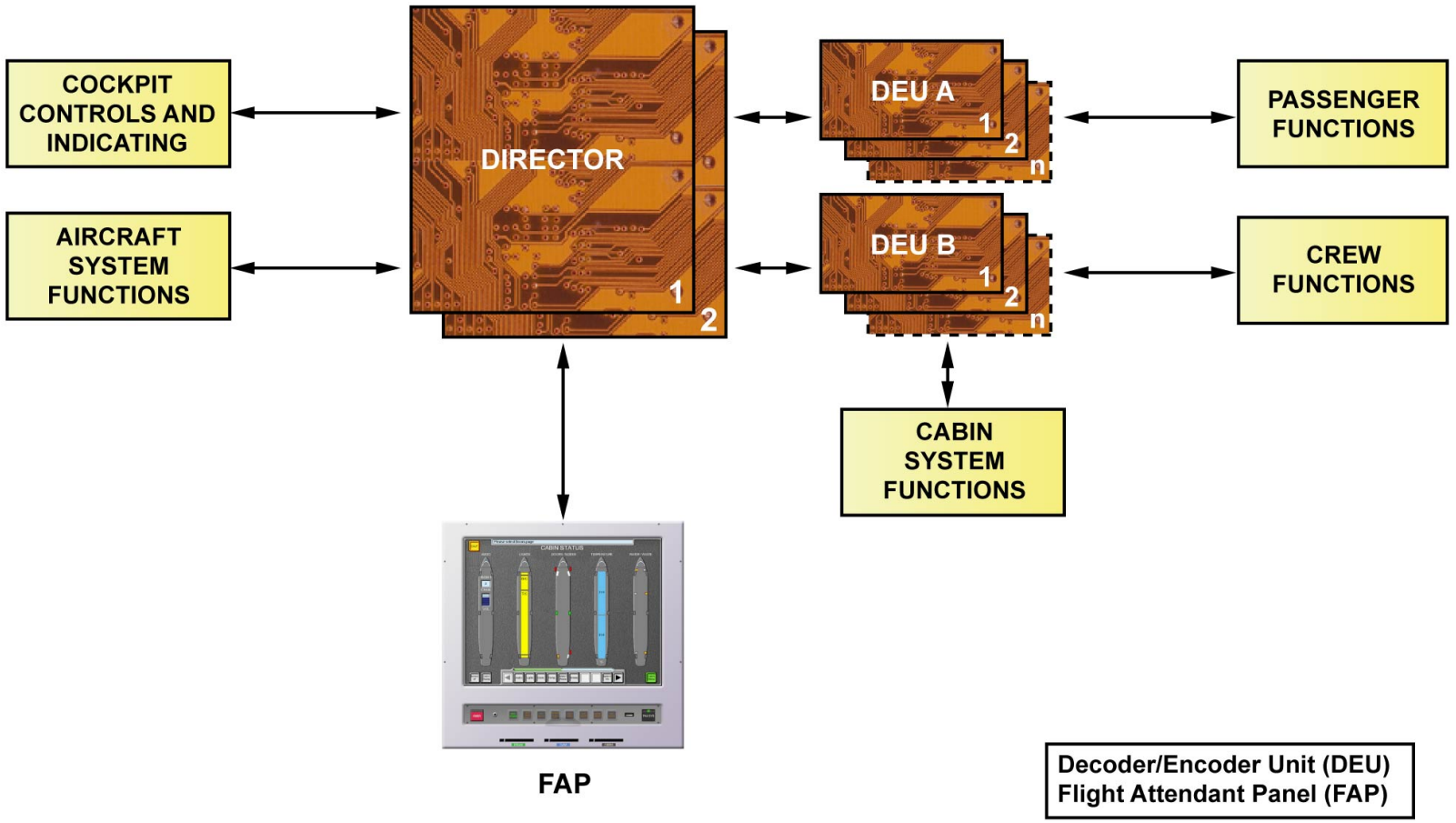
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CABIN INTERCOMMUNICATION DATA SYSTEM (continued)

SYSTEM OVERVIEW

The CIDS includes two directors, a touch-screen Flight Attendant Panel (FAP), and the DEUs. The touch screen FAP controls and indicates the status of the CIDS. Integrated within the FAP are Cabin Assignment Module (CAM), On Board Replaceable Module (OBRM) and Prerecorded Announcement and Music (PRAM) in flash card format.

UGB13131 - U2AT4M0 - UM23PZ00000002



CABIN INTERCOMMUNICATION DATA SYSTEM - SYSTEM OVERVIEW

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CABIN INTERCOMMUNICATION DATA SYSTEM (continued)

PASSENGER ENTERTAINMENT AND SIGNS

"No smoking" and "fasten seat belt" signs are controlled from the cockpit. The FAP audio page gives controls and displays for the PRAM.

The PRAM can be a flash card type, directly plugged into the FAP. An audio reproducer (cassette/compact disc) can also be installed. Passenger Address (PA), BoardinG Music (BGM), Video Announcements (VAs) and PRAM functions can be provided to the passenger through the In Flight Entertainment System (IFES).

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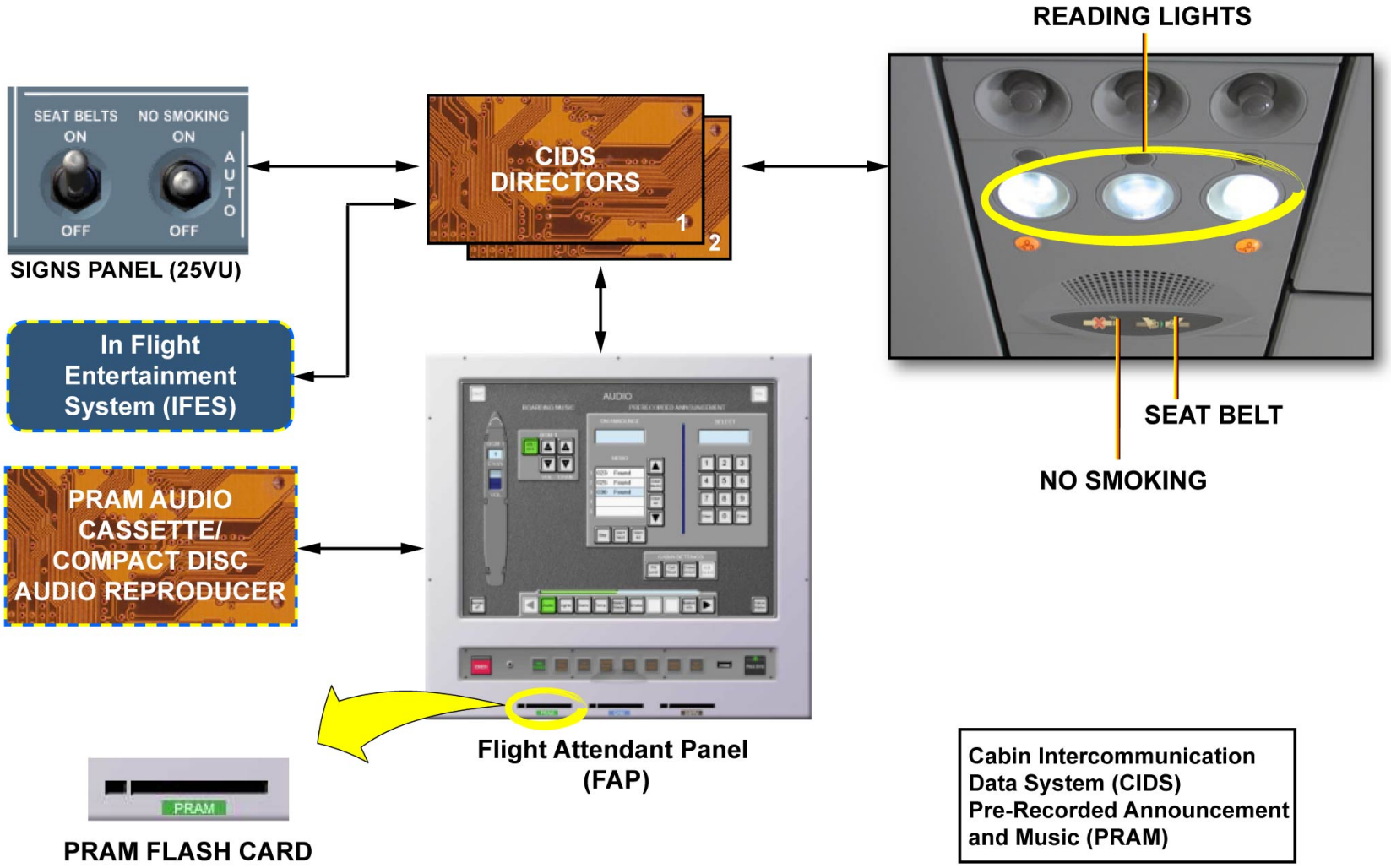


CABIN INTERCOMMUNICATION DATA SYSTEM - PASSENGER ENTERTAINMENT AND SIGNS

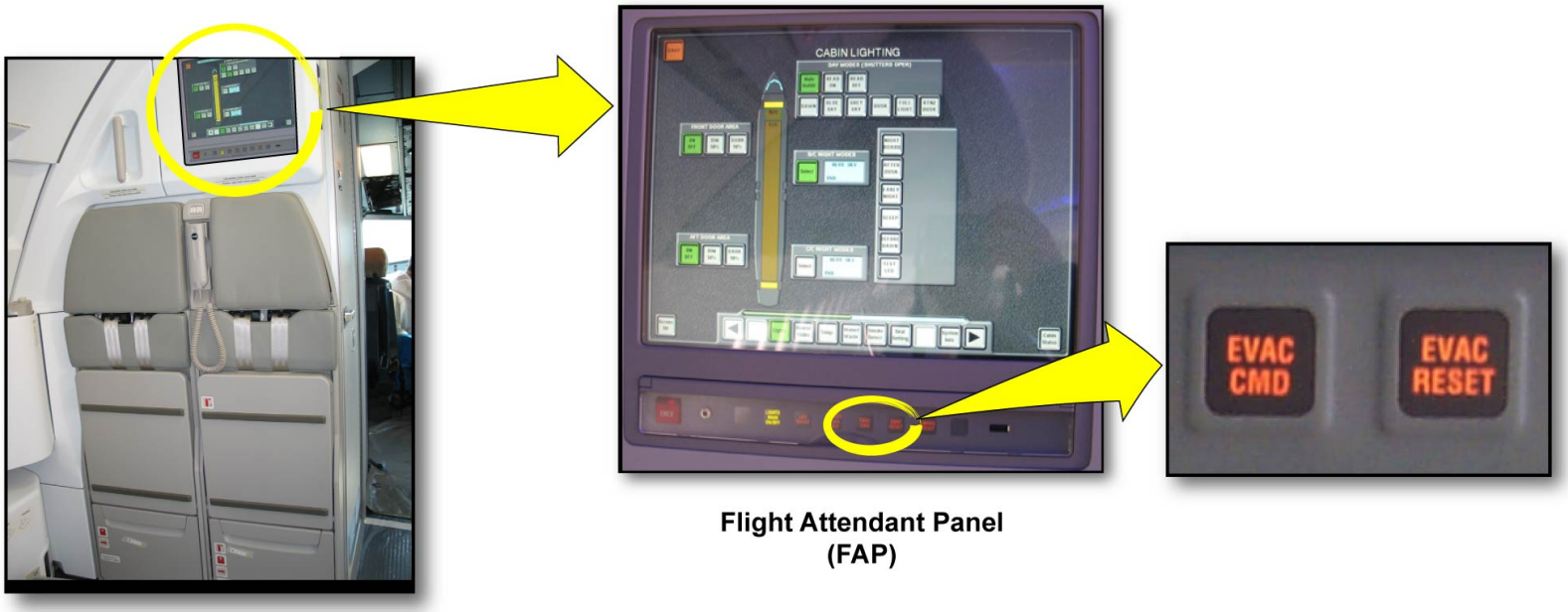
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CABIN INTERCOMMUNICATION DATA SYSTEM (continued)

EVACUATION COMMAND SYSTEM

The emergency evacuation command may be activated from the cockpit, from the purser station, and optionally from the Additional Attendant Panel (AAP).
The EVAC signal can be reset from the cockpit, FAP, AAP.
The FAP, EVAC CMD and EVAC RESET P/Bs are installed on the hard key panel to be available at any time regardless of the FAP page shown.
On the EVAC panel in the cockpit, the EVAC switch lets the evacuation command be activated from the purser station and the cockpit, or from the cockpit only.

UGB13131 - U2AT4M0 - UM23PZ00000002



CABIN INTERCOMMUNICATION DATA SYSTEM - EVACUATION COMMAND SYSTEM

CABIN INTERCOMMUNICATION DATA SYSTEM - EVACUATION COMMAND SYSTEM

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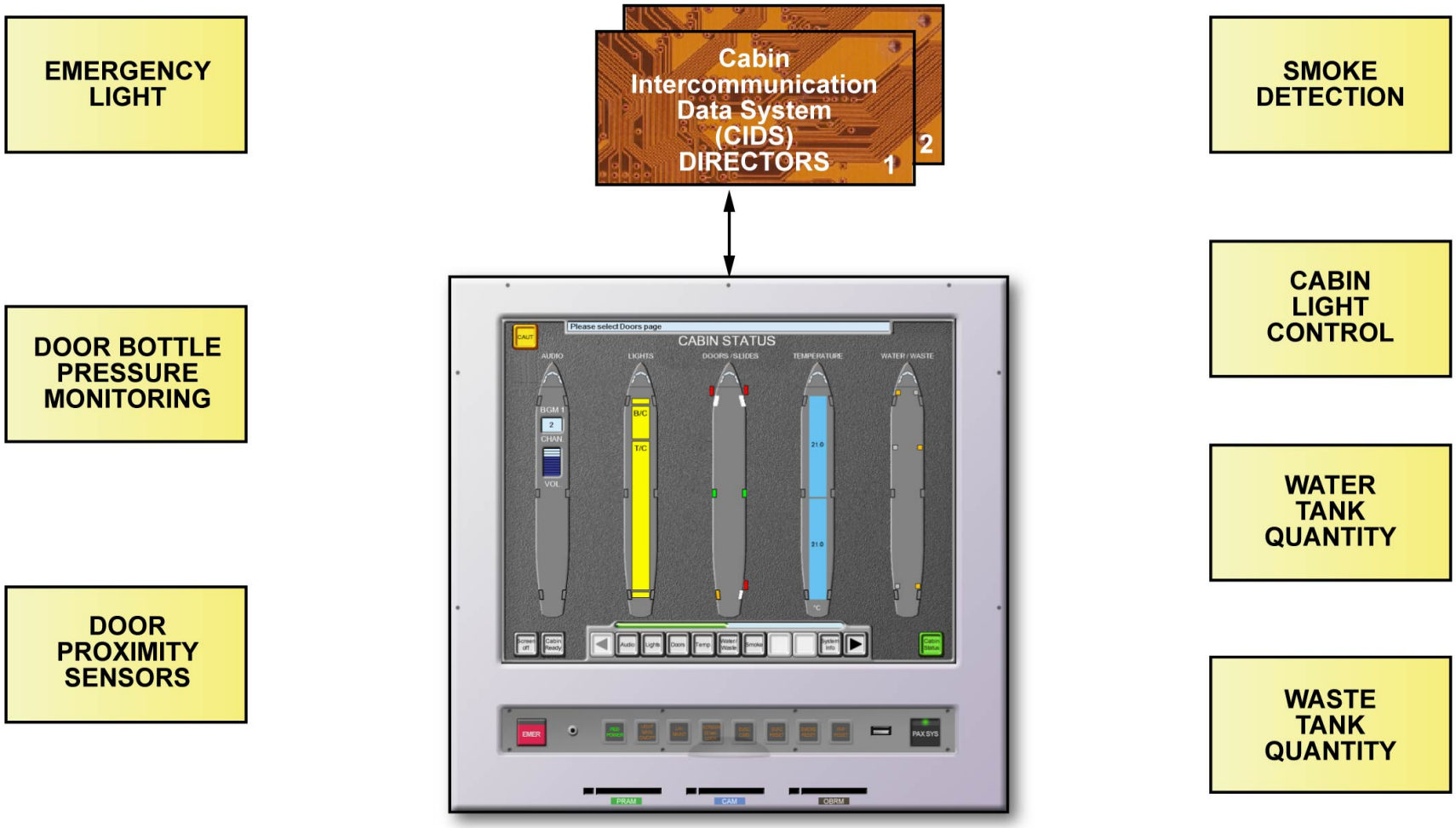
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CABIN INTERCOMMUNICATION DATA SYSTEM (continued)

AIRCRAFT DATA MANAGEMENT

In the CIDS, the FAP displays the current cabin status on the CABIN STATUS page. The CIDS and related cabin systems are controlled and monitored from the FAP by its related page.

UGB13131 - U2AT4M0 - UM23PZ00000002



Flight Attendant Panel (FAP)

CABIN INTERCOMMUNICATION DATA SYSTEM - AIRCRAFT DATA MANAGEMENT

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CIDS CONTROL AND INDICATING

In this topic are described the purser station, the cabin crew station, and the area call panel.

PURSER STATION

The purser station has a FAP.
In the CIDS system, the functions are done by:
- the FAP for monitoring, control and testing,
- the MCDU for testing interface.

UGB13131 - U2AT4M0 - UM23PZ00000002

Flight Attendant Panel (FAP)

CIDS CONTROL AND INDICATING - PURSER STATION

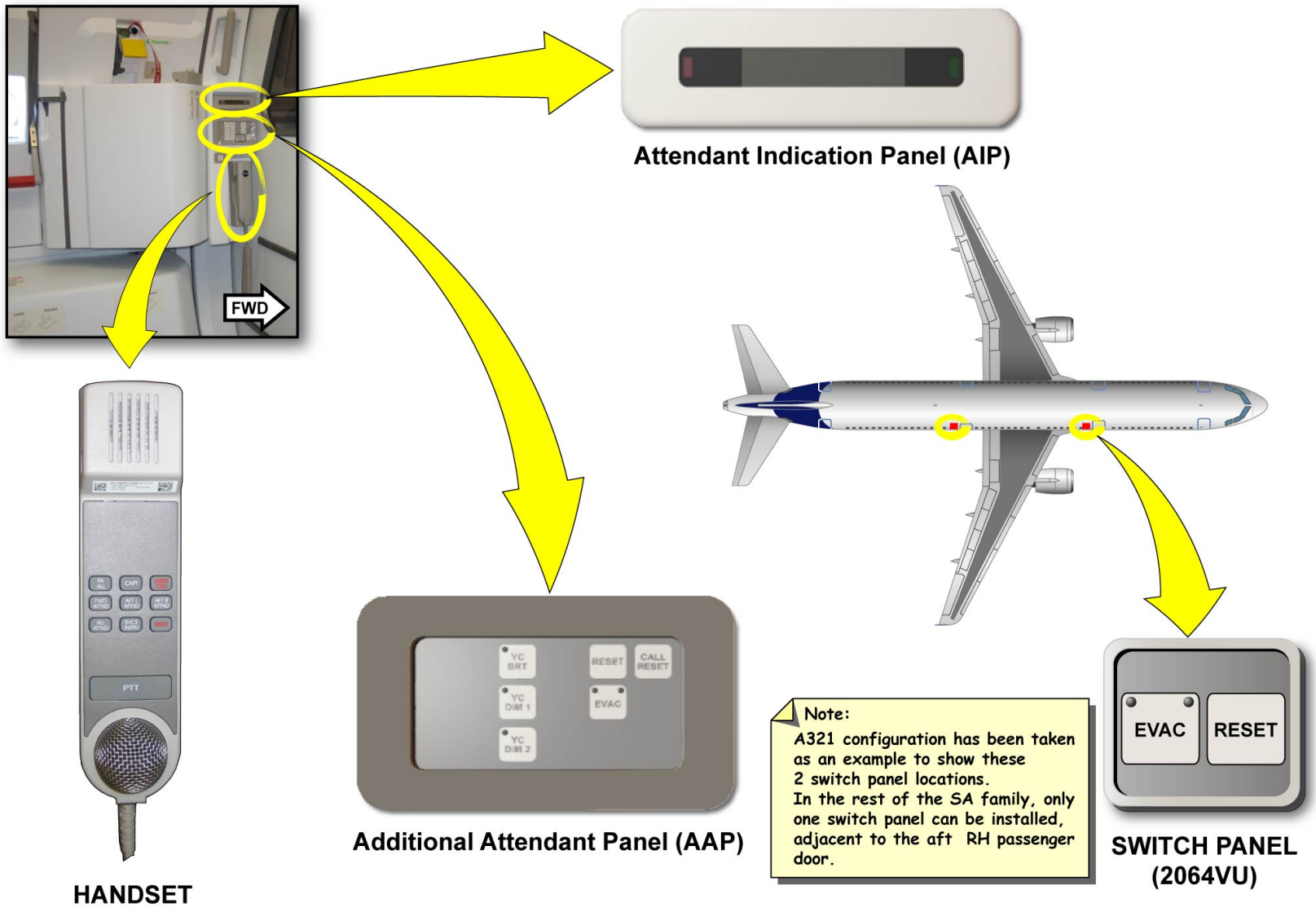
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CIDS CONTROL AND INDICATING (continued)

CABIN CREW STATION

Each crew station has:
- a handset,
- an Additional Attendant Panel (AAP),
- an Attendant Indication Panel (AIP),
- two switch panels installed adjacent to the middle RH attendant station for an A321.
- a switch panel, installed adjacent to the aft RH passenger door (A318/A319/A320).

UGB13131 - U2AT4M0 - UM23PZ00000002


FWD
Attendant Indication Panel (AIP)
HANDSET
YC BRT
YC DIM 1
YC DIM 2
RESET
CALL RESET
EVAC
Additional Attendant Panel (AAP)
Note:
A321 configuration has been taken as an example to show these 2 switch panel locations.
In the rest of the SA family, only one switch panel can be installed, adjacent to the aft RH passenger door.
EVAC
RESET
SWITCH PANEL (2064VU)

CIDS CONTROL AND INDICATING - CABIN CREW STATION

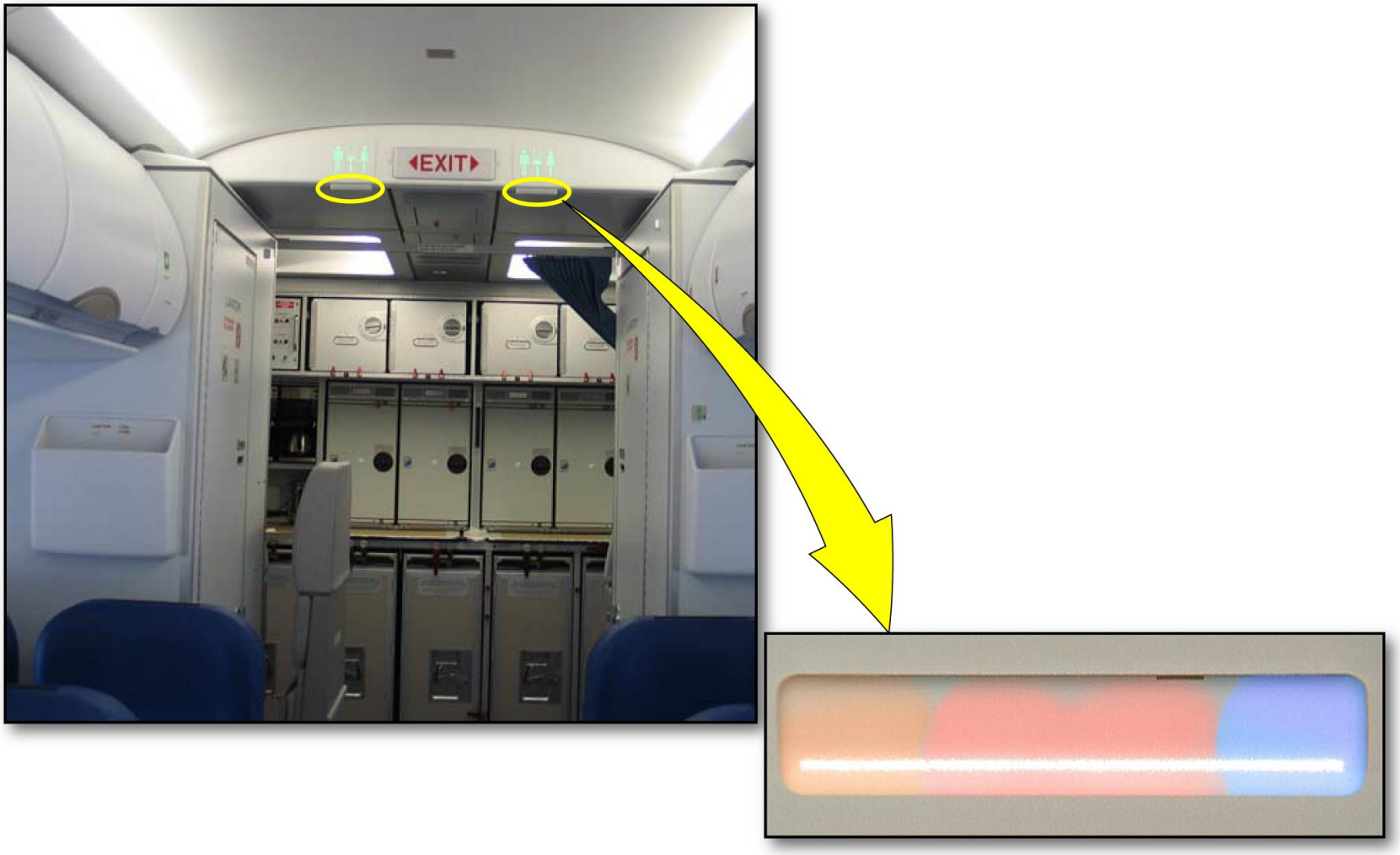
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

CIDS CONTROL AND INDICATING (continued)

AREA CALL PANEL

The Area Call Panel (ACP) indicates:
- crew calls (pink steady or flashing),
- passenger call (blue steady),
- lavatory call (amber steady),
- lavatory smoke detection (amber flashing).

UGB13131 - U2AT4M0 - UM23PZ00000002

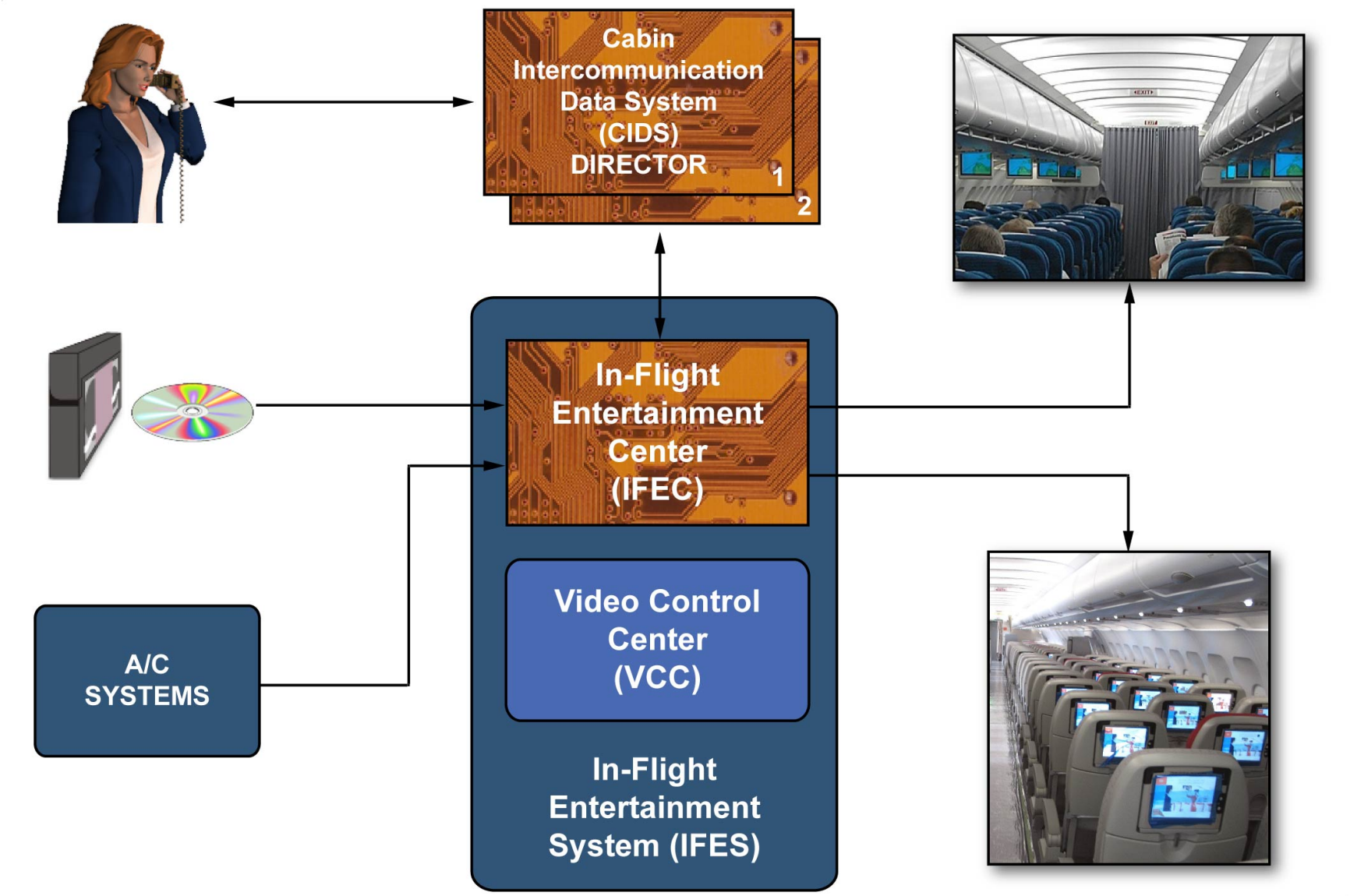


CIDS CONTROL AND INDICATING - AREA CALL PANEL

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

PASSENGER ENTERTAINEMENT SYSTEM (OPTIONAL)

The Passenger Entertainment System (PES) also called IFES gives audio and video programs to passengers. It can also give flight information and interactive utilities.



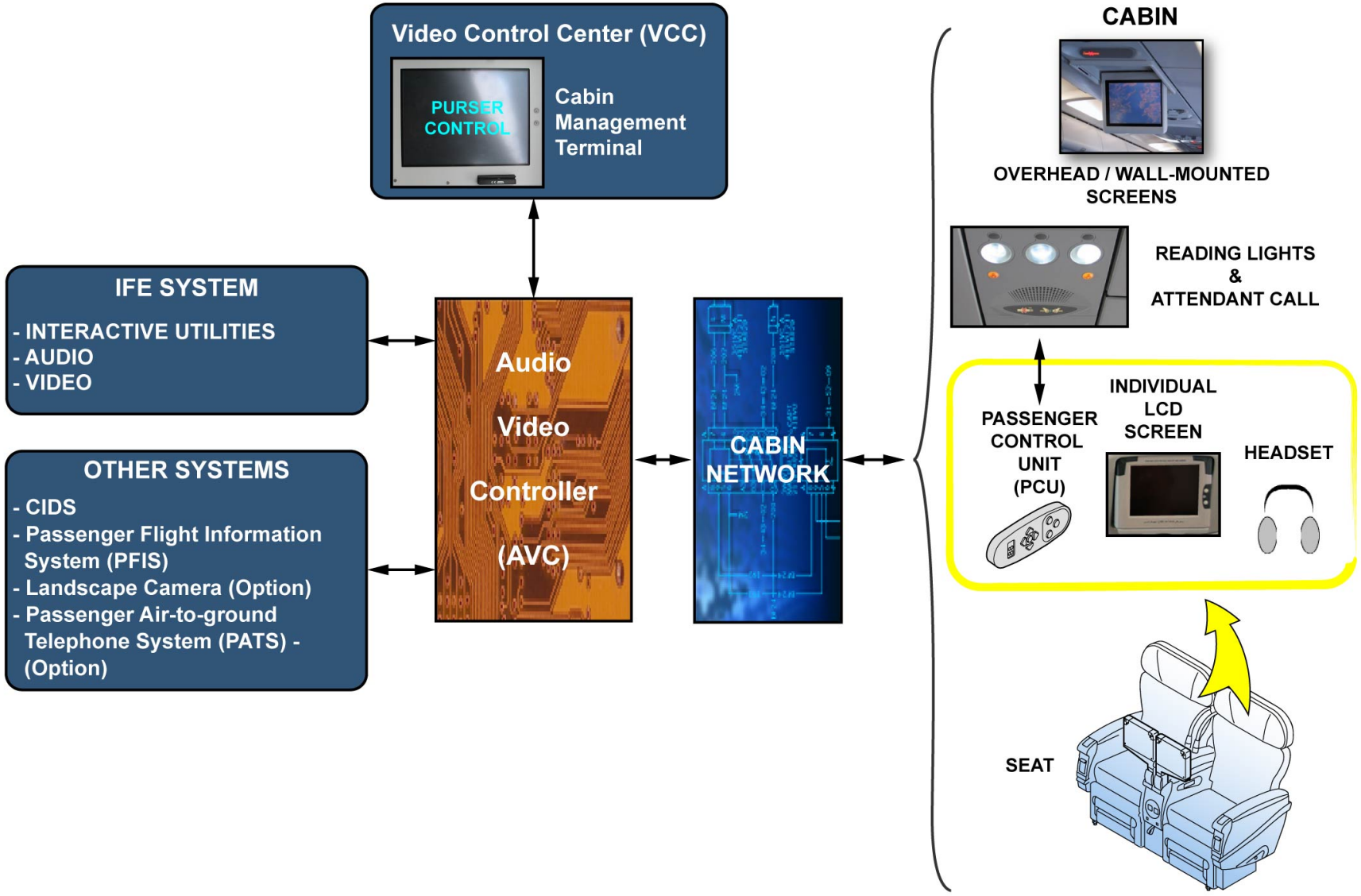
PASSENGER ENTERTAINEMENT SYSTEM (OPTIONAL)

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

PASSENGER ENTERTAINEMENT SYSTEM (OPTIONAL) (continued)

OVERVIEW

The Purser Control is connected to the Audio Video Controller (AVC). The AVC makes the interface between the core system and the passengers. It will manage cabin crew and passenger requests and answers as well as interaction with other systems. The distribution is done through a cabin network to the passenger environment. The passengers use the Passenger Control Unit (PCU) to select the channel and the volume of the audio and video programs. It is also used to control the reading lights and to call the cabin attendant. Videos are broadcasted in the cabin on overhead or wall mounted LCD screens. LCD screens can be installed on the armrest of the seat or the back of the seat in front. They are used with the PCU to control the audio/video program. Passengers can access audio, video, interactive games and the web from their seats. This is offered via a menu displayed on the LCD screens and available immediately after IFE system power-up. In-seat telephone facilities can be installed in the cabin. The IFES is connected to the Passenger Air-to-ground Telephone System (PATS). The PCU is then used as a telephone handset.

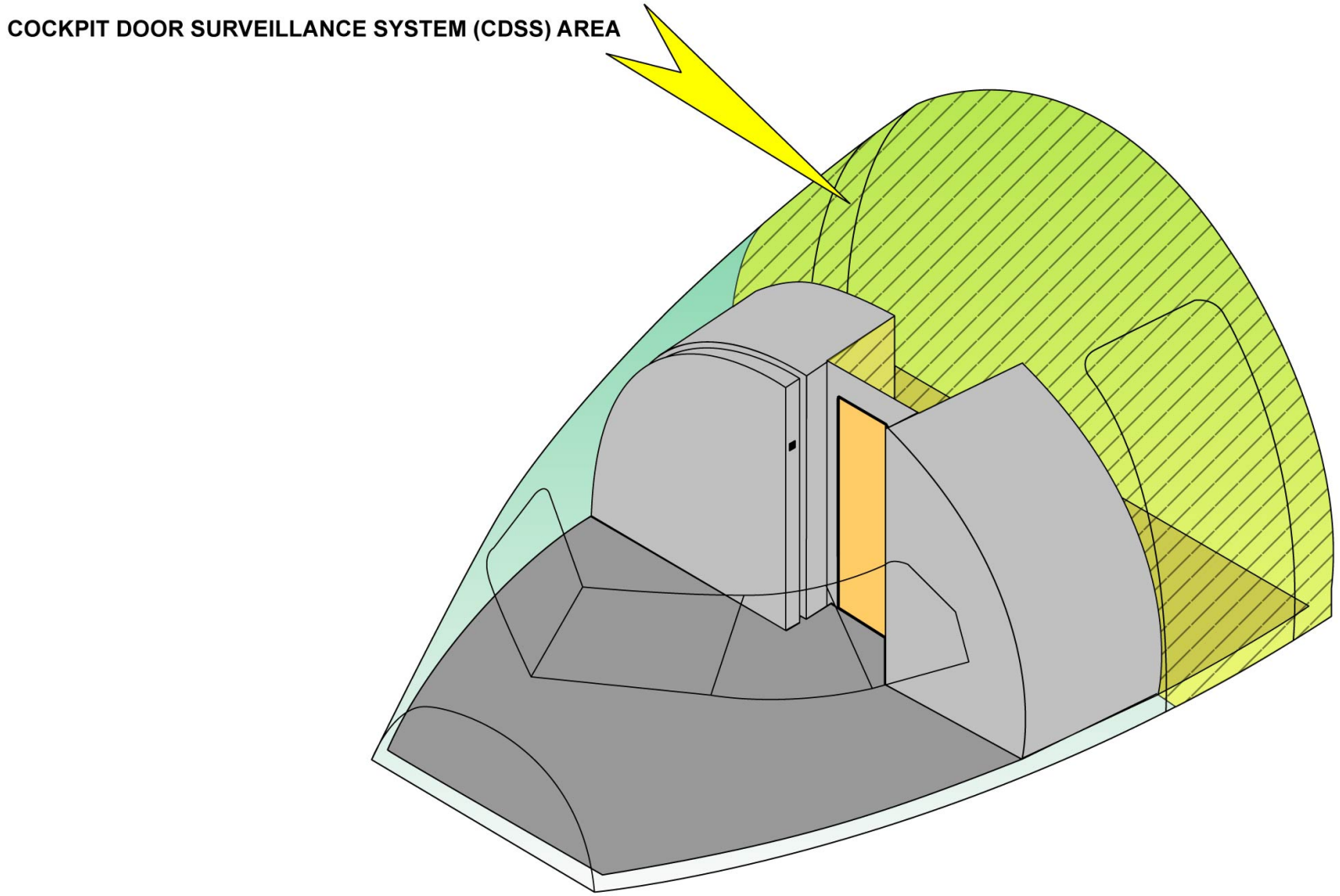


PASSENGER ENTERTAINEMENT SYSTEM (OPTIONAL) - OVERVIEW

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

COCKPIT DOOR SURVEILLANCE SYSTEM

A Cockpit Door Surveillance System (CDSS) is installed on top of the wiring provisions to let the flight crew identify a person in front of the cockpit door and to survey the hidden cross section in the door number 1 area.



COCKPIT DOOR SURVEILLANCE SYSTEM

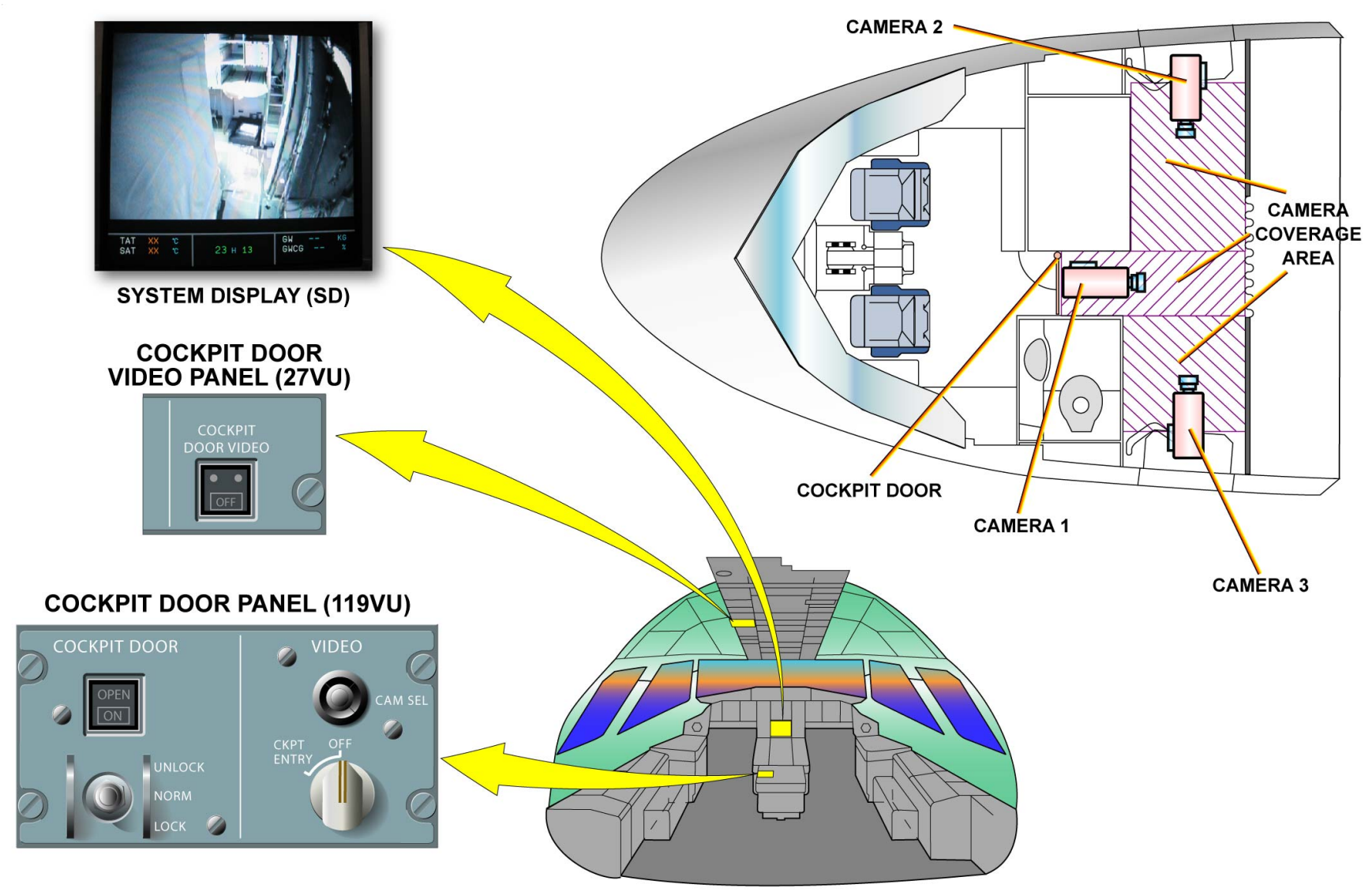
23 COMMUNICATIONS SYSTEM PRESENTATION (1)

COCKPIT DOOR SURVEILLANCE SYSTEM (continued)

OVERVIEW

The CDSS has the following components:
- 3 "NTSC video format" black and white video cameras in the door number 1 area,
- 1 ON/OFF P/BSW installed on the COCKPIT DOOR VIDEO panel,
- 1 camera select momentary P/B installed on the COCKPIT DOOR panel,

UGB13131 - U2AT4M0 - UM23PZ00000002



COCKPIT DOOR SURVEILLANCE SYSTEM - OVERVIEW

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

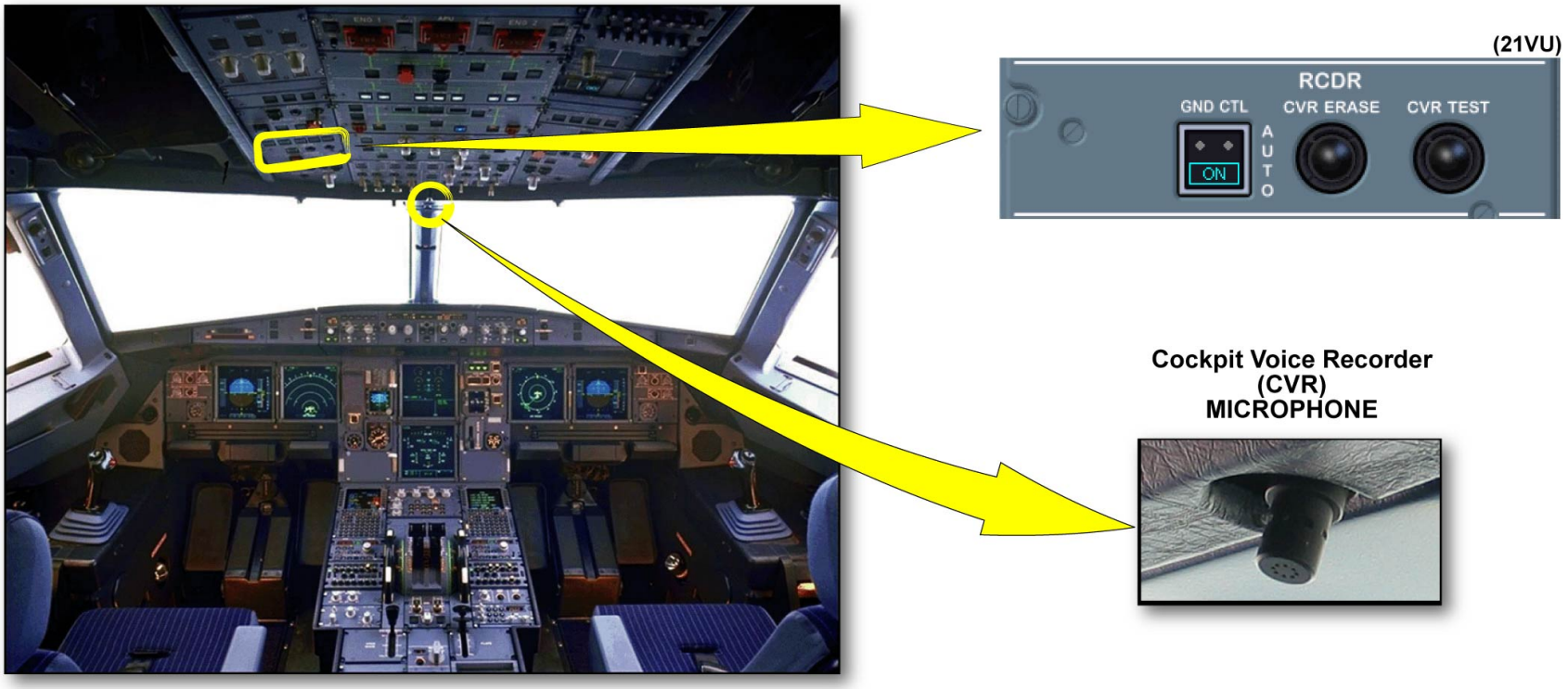
SOLID STATE COCKPIT VOICE RECORDER-SSCVR

The cockpit voice recorder records the last 2 hours of the flight crew conversations and communications and aural warnings. It records automatically in flight and on ground when at least 1 engine is running and for 5 minutes after the last engine is shut down and also 5 minutes after aircraft energization.

SSCVR CONTROL AND INDICATING

The Cockpit Voice Recorder (CVR) control panel gives CVR controls for manual erasure and test of the recording.

UGB13131 - U2AT4M0 - UM23PZ00000002



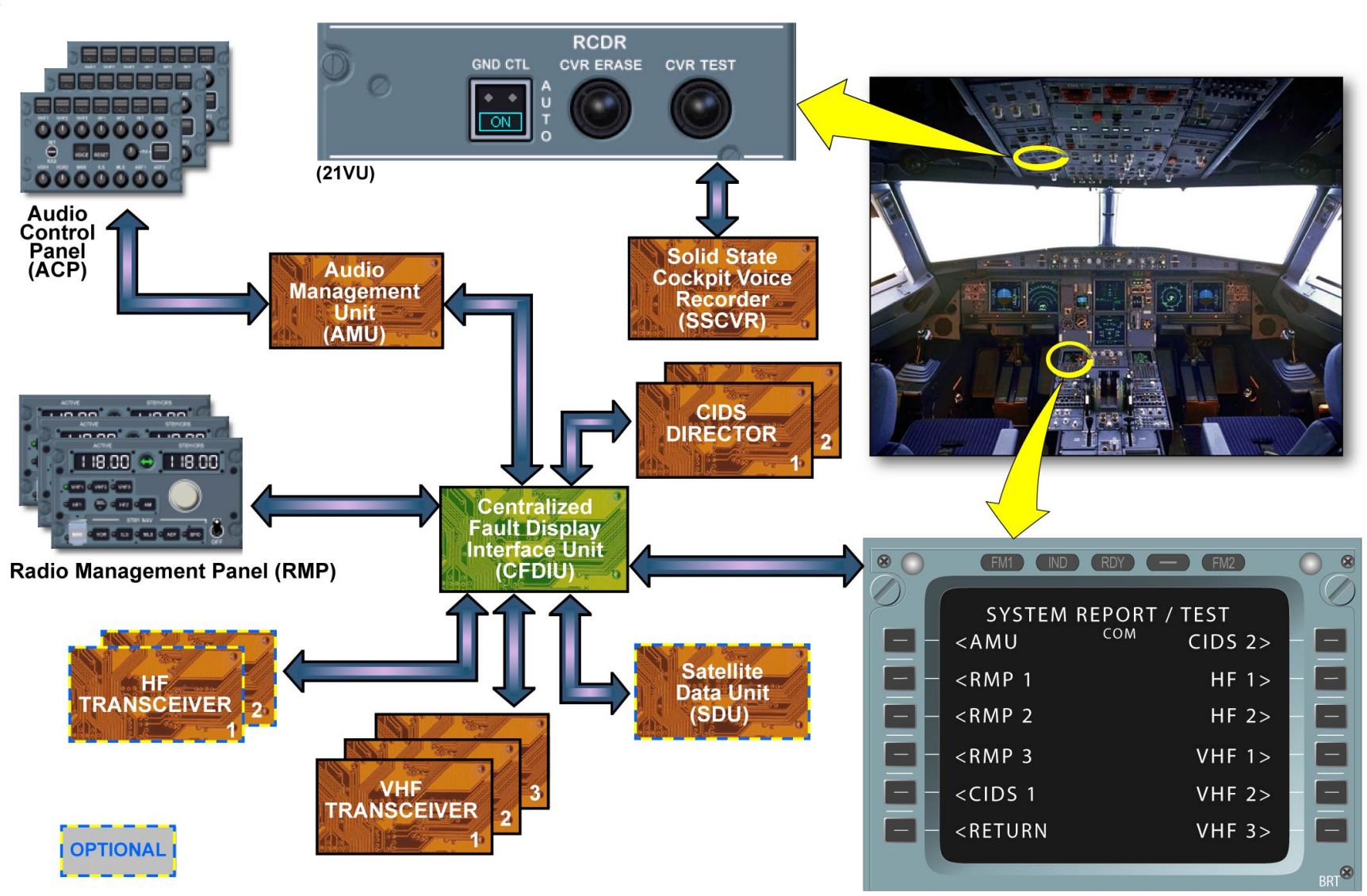
SOLID STATE COCKPIT VOICE RECORDER-SSCVR & SSCVR CONTROL AND INDICATING

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

All the communication sub-systems can be tested through the MCDU except the CVR system.

UGB13131 - U2AT4M0 - UM23PZ00000002



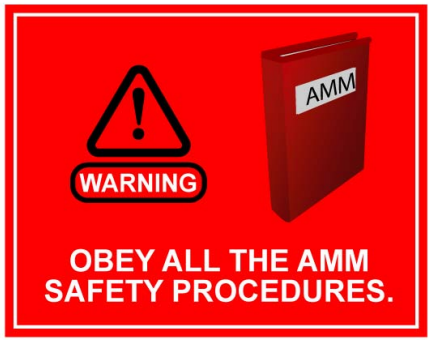
MAINTENANCE/TEST FACILITIES

23 COMMUNICATIONS SYSTEM PRESENTATION (1)

SAFETY PRECAUTIONS

When you work on aircraft, make sure that you obey all the Aircraft Maintenance Manual (AMM) safety procedures.
This will prevent injury to persons and/or damage to aircraft. Here is an overview of main safety precautions related to the communications system.
Although the HF antenna is mounted under the leading edge of the vertical stabilizer, the RF energy given out during transmissions can cause an explosion during refueling. DO NOT TRANSMIT during refueling.

UGB13131 - U2AT4M0 - UM23PZ00000002



SAFETY PRECAUTIONS

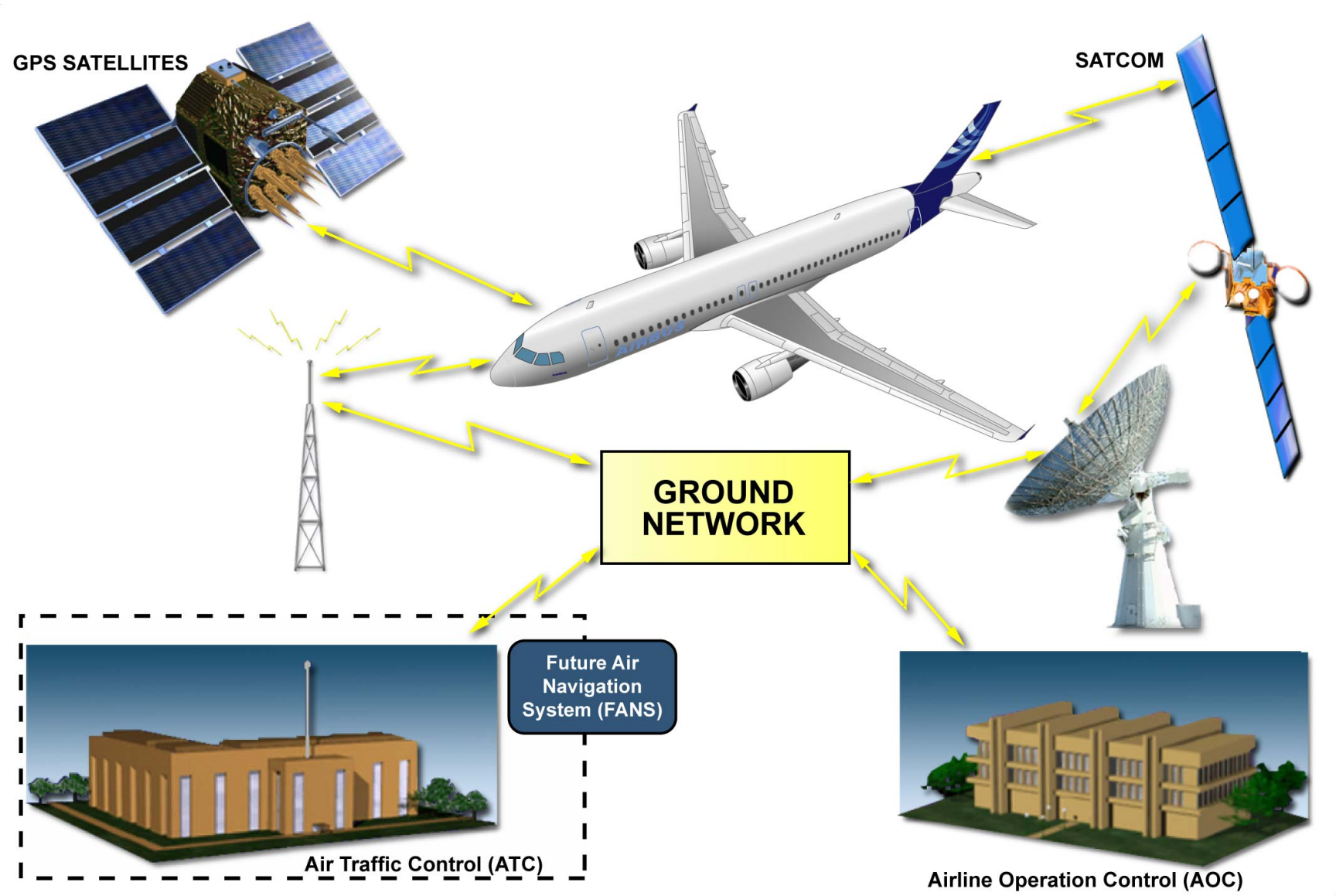
46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

GENERAL

The Air Traffic Information Management System (ATIMS) complies with the future developments of the Communication, Navigation, Surveillance and Air Traffic Management (ATM) also known as Future Air Navigation System (FANS). It covers the evolution of the way the airspace will be used in the years to come.
It will be used in different operational environments and is designed to be easily configured to the airlines needs.
ATIMS enables data-link communication: VHF Data Radio (VDR), HF Data Radio (HFDR) and SATCOM (if installed) and the exchange of complex data or specific reports between the aircraft and the ground centers:
- controller pilot data-link communications (HF voice in backup) for air traffic management,
- automatic reporting (position, intention) for air traffic surveillance,
- specific airline/aircraft communications (operational control) to improve airline operational costs and flexibility.

Standard AOC functionalities are basically provided but airlines can customize these functions and the way they are accessed by the crew.
On the ground, the different existing networks dispatch the messages. These networks are operated by private companies such as ARINC, SITA and others, which are known as service providers.

UGB13131 - U2AT4M0 - UM46PZ000000001


GPS SATELLITES
SATCOM
GROUND NETWORK
Future Air Navigation System (FANS)
Air Traffic Control (ATC)
Airline Operation Control (AOC)

GENERAL

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

GENERAL (continued)

PRE-FANS, FANS

There are three stages of FANS development.
- Pre-FANS (Communications (COM) and AOC functions),
- FANS A (pre-FANS + ATC functions) and
- FANS B (FANS A + improved ground network + Traffic Alert and Collision Avoidance System (TCAS)).

Today, the pre-FANS allow the AOC function.
It provides the crew with Aircraft Communication Addressing and Reporting System (ACARS) equivalent functions and more, as for instance:
- NOtice To AirMen (NOTAM), weather, winds aloft requests,
- free text message exchanges,
- diversion, delay, refueling, flight reports,
- aircraft data from Centralized Fault Display System (CFDS), Aircraft Integrated Data System (AIDS), cabin terminal...etc.

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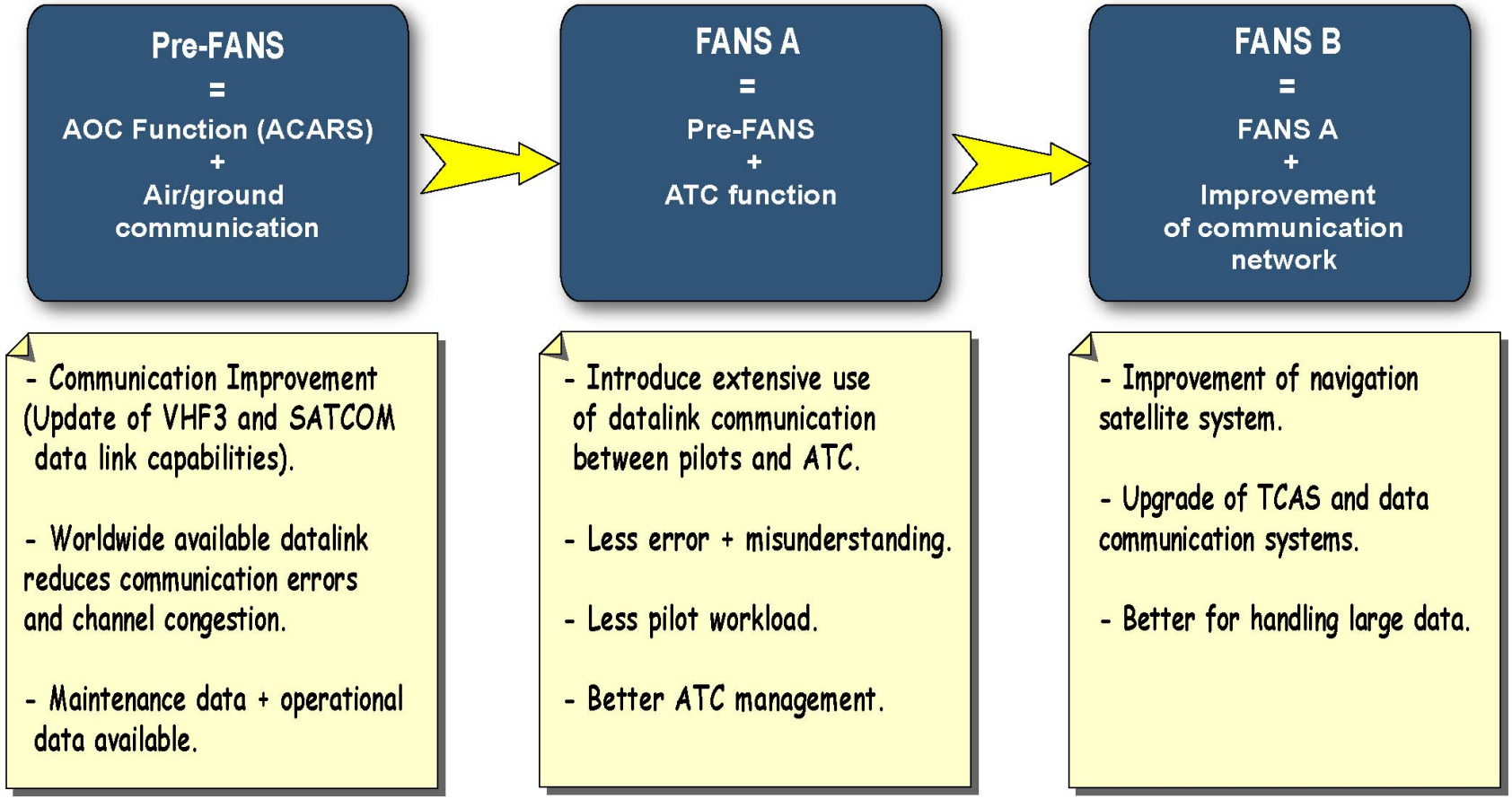


ACARS: Aircraft Communication Adressing and Reporting System
AOC: Airline Operation Center
ATC: Air Traffic Control
FANS: Future Air Navigation System

GENERAL - PRE-FANS, FANS

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

ARCHITECTURE

The ATIMS pre-FANS configuration mainly has an Air Traffic Service Unit (ATSU).
The ATSU is used:
- to manage communications (air/ground data-links),
- to manage applications (on board data routing).

The ATSU is configured in pre-FANS to do:
- the management of air/ground communication,
- Airline Operational Control applications.

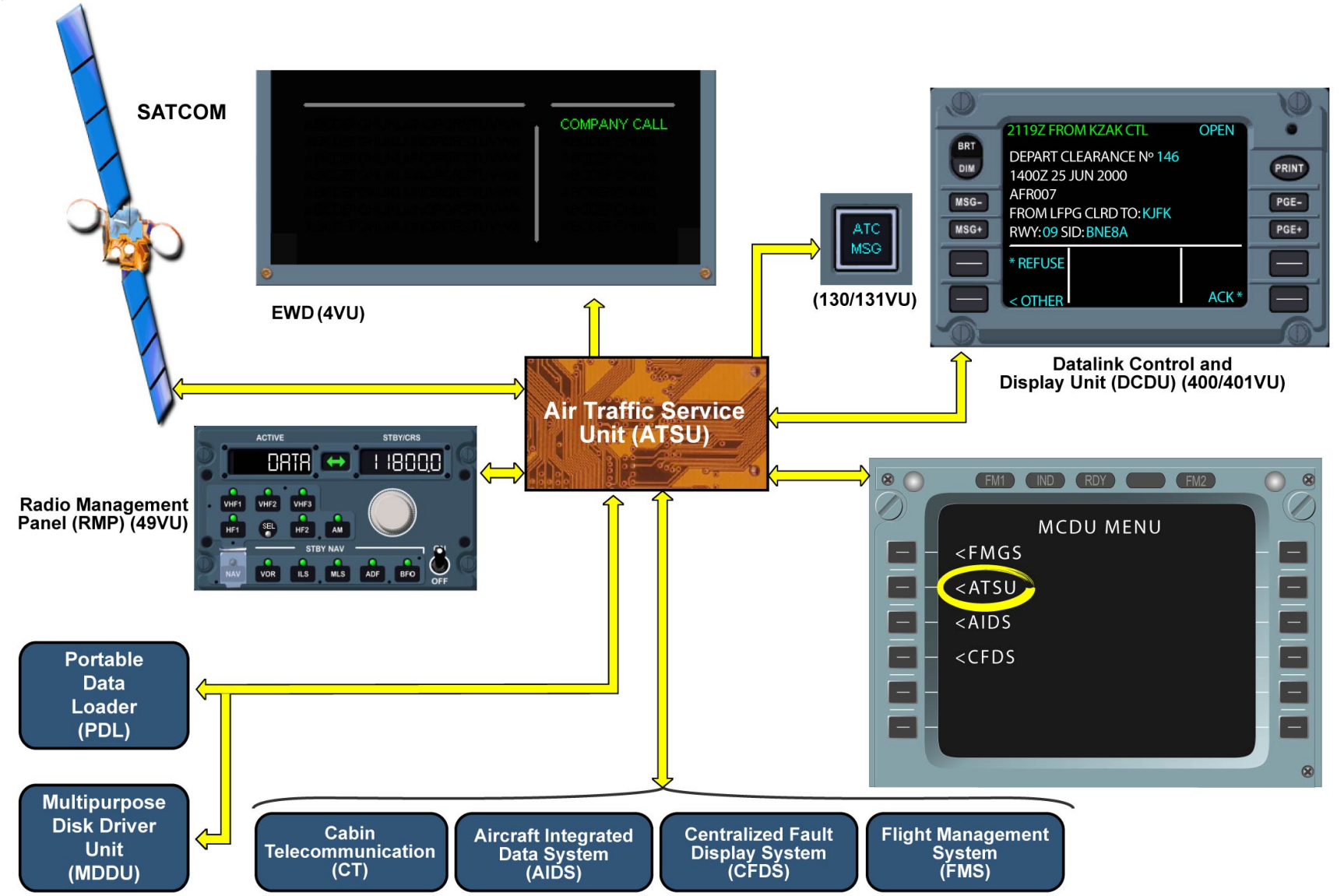
The communication devices include:
- the SATCOM, if installed,
- the VDR
- the HF.

The Pre FANS crew interfaces include:
- the ECAM, and,
- the MCDU.

For FANS-A and FANS-B equipped aircraft there are:
- two Datalink Control and Display Units (DCDUs),
- two attention getter pushbuttons, marked "ATC MSG",
- the MCDU "ATC COM" key operative.

The ATSU manages the communication message exchanges to and from the peripheral computers (on-board routing function).
The software is uploaded in the ATSU by means of the Multipurpose Disk Driver Unit (MDDU) or the Portable Data Loader (PDL).

UGB13131 - U2AT4M0 - UM46PZ000000001



ARCHITECTURE

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

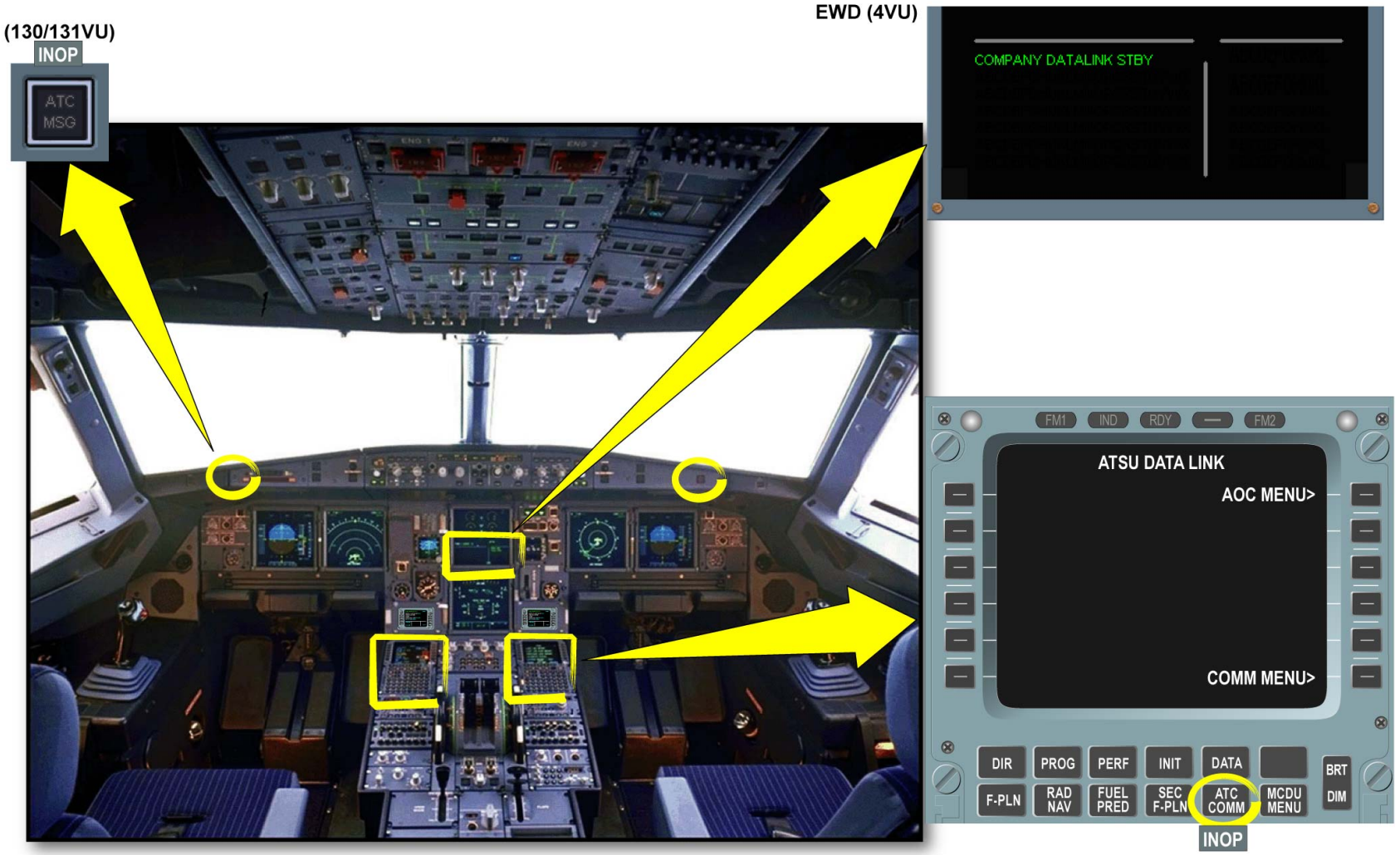
CONTROL AND INDICATING

We will now have a look at the control and indicating of the system.

PRE-FANS

The ATSU line key from the MCDU MENU gives access to:
- AOC MENU line key and,
- COMM line key.

MCDU "ATC COM" key is inoperative.
The COMM line key gives access to the COMM MENU, which is used for the management and control of the air/ground router.
The AOC line key gives access to the AOC MENU page, which is used for the management of AOC functions (equivalent to ACARS functions).
The content of this menu depends on the AOC applications selected by the airline.
Messages related to the pre-FANS status are displayed on the EWD.
The "ATC MSG" pushbutton is inoperative.



CONTROL AND INDICATING - PRE-FANS

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

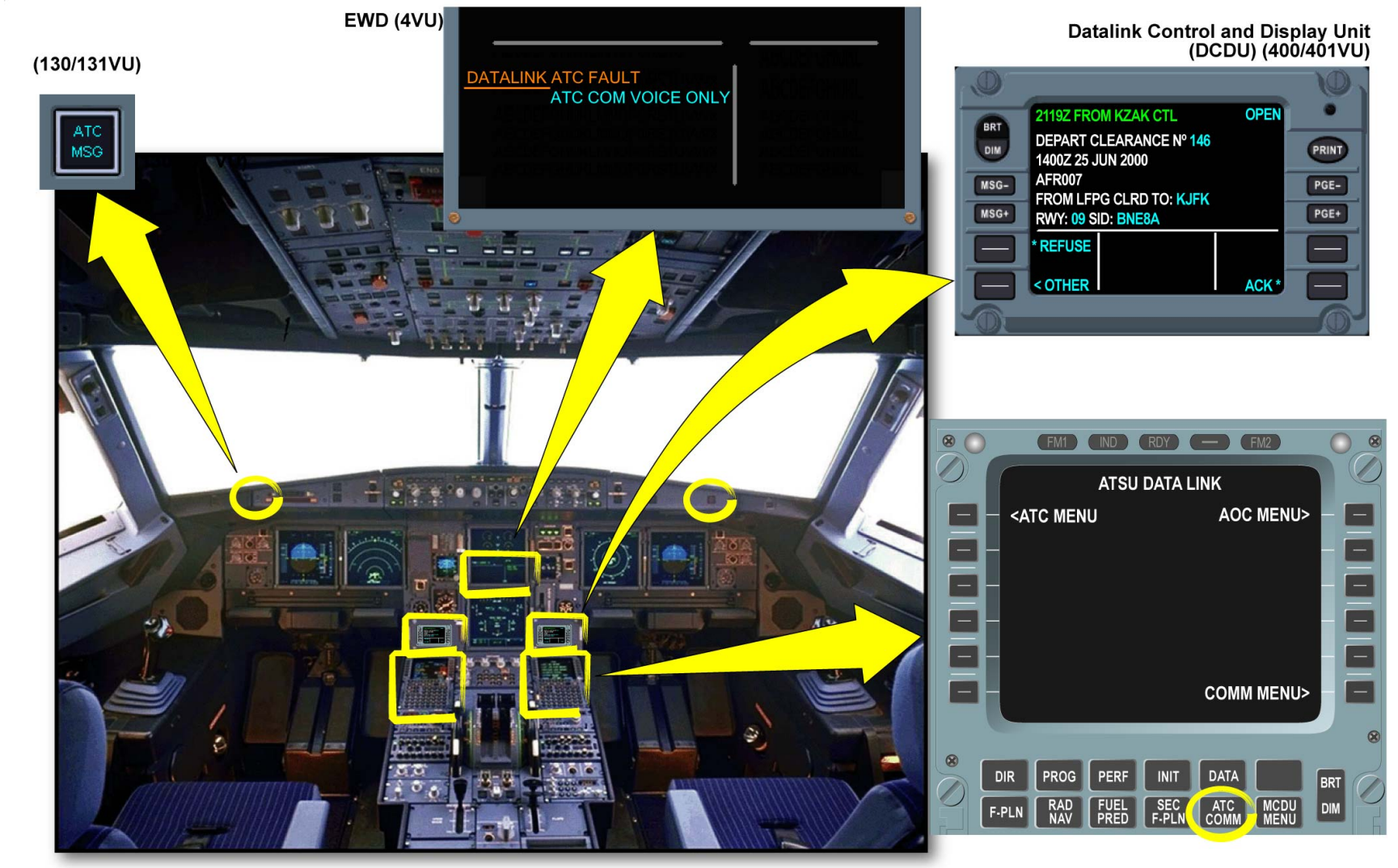
CONTROL AND INDICATING (continued)

FANS

In FANS configuration the "ATC MENU" prompt is available to get access to ATC pages. The "ATC COMM" key gives the same access but as a shortcut.
Two attention getter pushbuttons are operative and indicate ATC incoming messages.
Two DCDUs give full time accessibility and readability for messages exchanged with the ATC and both crew, which require only limited head-down time.
Text messages instead of voice communication reduce the risk of misunderstanding.

NOTE: Note: The DCDUs are the interfaces for ATC messages only.

UGB13131 - U2AT4M0 - UM46PZ000000001



CONTROL AND INDICATING - FANS

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

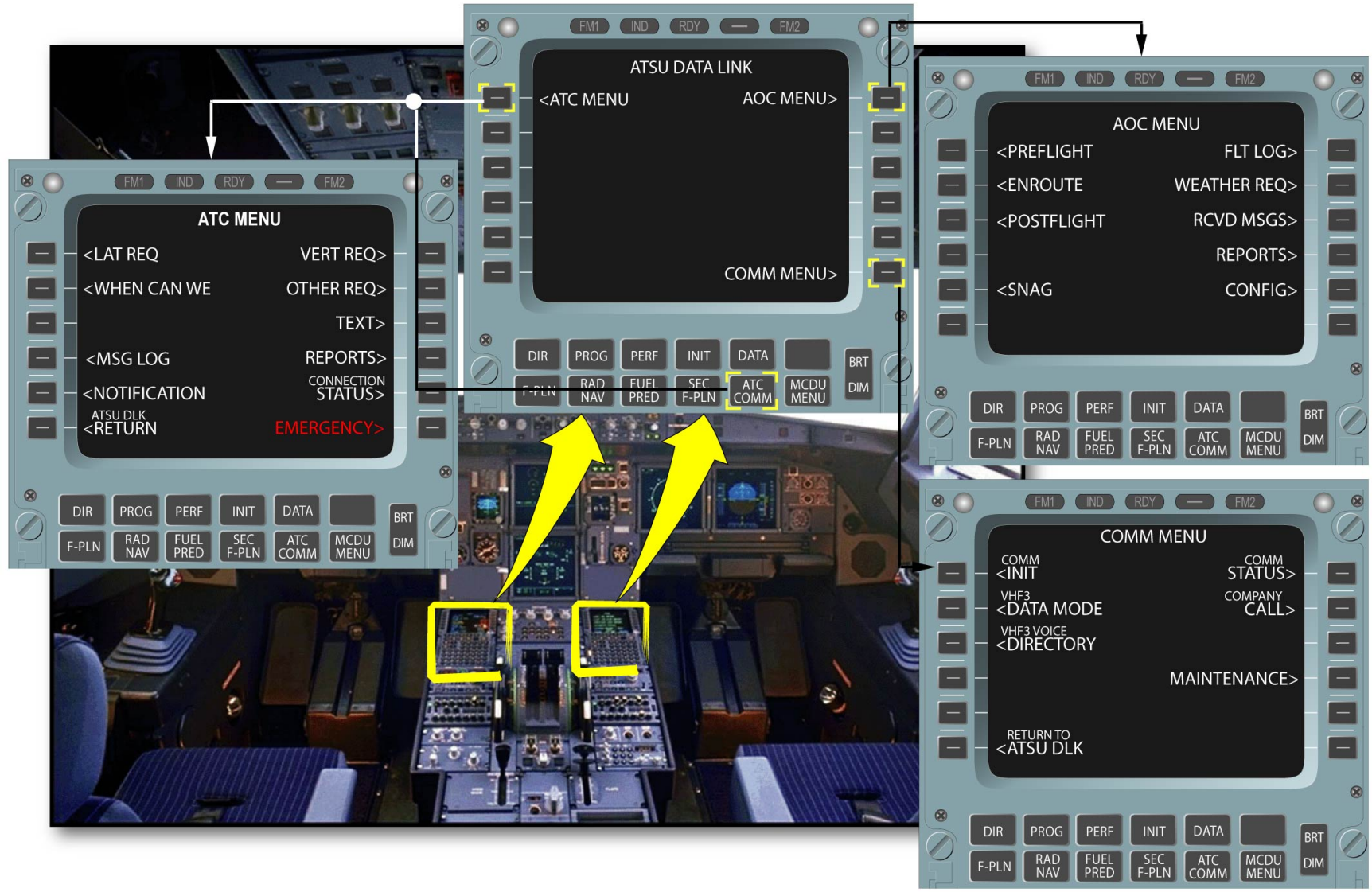
CONTROL AND INDICATING (continued)

MCDU MENU

The COMM MENU is used for communication settings, as selection of the Service provider and frequency.
The AOC MENU line key gives access to the AOC MENU which is equivalent to ACARS functions.
The content of this menu depends on the AOC applications selected by the airline.
The ATC MENU gives access to the least frequent ATC operations, which are:
- data entry for message preparation,
- access to previously exchanged messages (MSG LOG).

Note that the ATC COMM key has the same functions as ATC MENU but provides quick access to the page whatever the MCDU menus displayed.

UGB13131 - U2AT4M0 - UM46PZ000000001



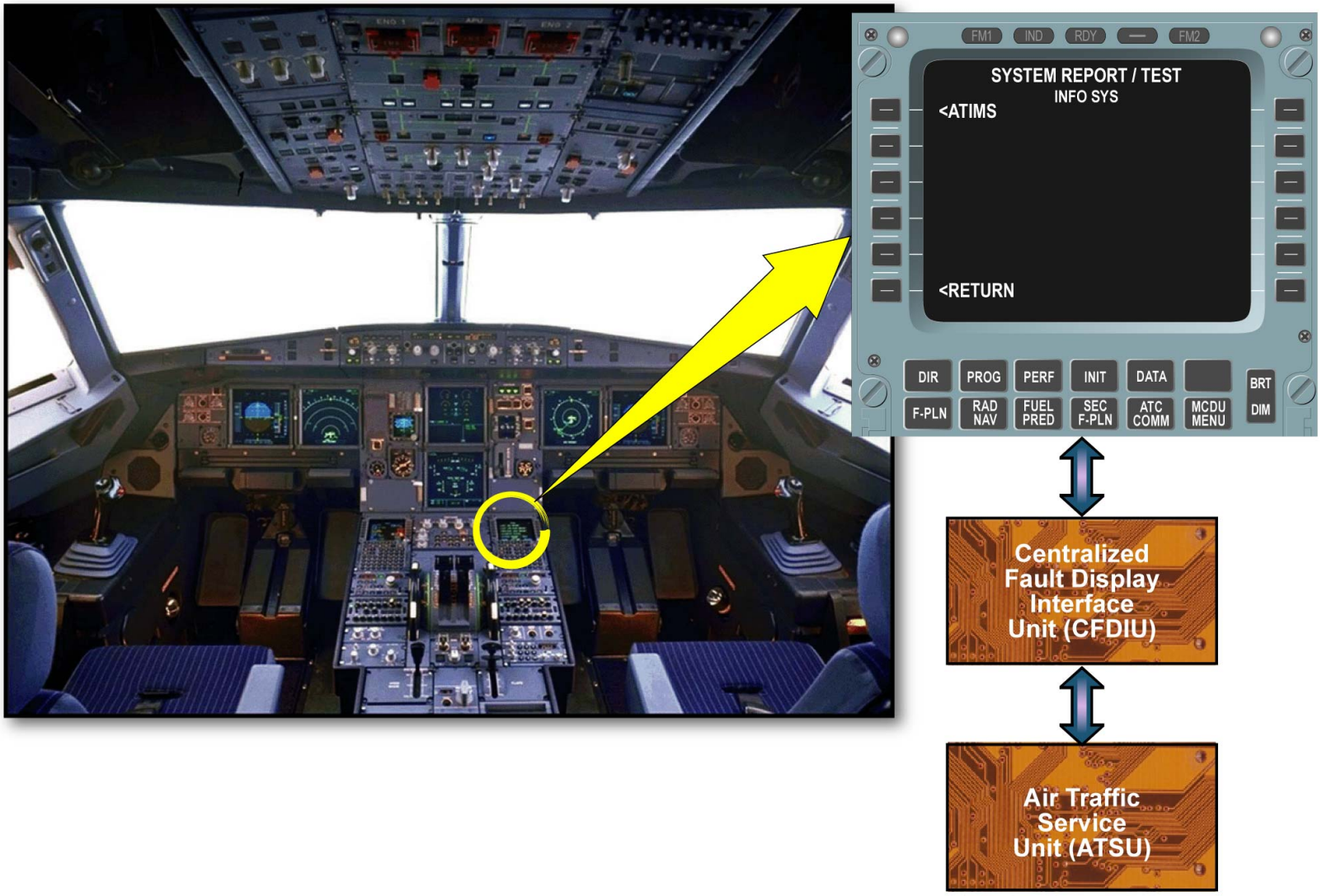
CONTROL AND INDICATING - MCDU MENU

46 AIR TRAFFIC INFO MANAGEMENT SYS PRES. (1)

MAINTENANCE/TEST FACILITIES

The ATIMS BITE information and test request are available through MCDU menus which communicate with the ATSU BITE.
The ATIMS maintenance menu is accessible using the "ATIMS" prompt from the COM SYSTEM REPORT/TEST page.

UGB13131 - U2AT4M0 - UM46PZ000000001

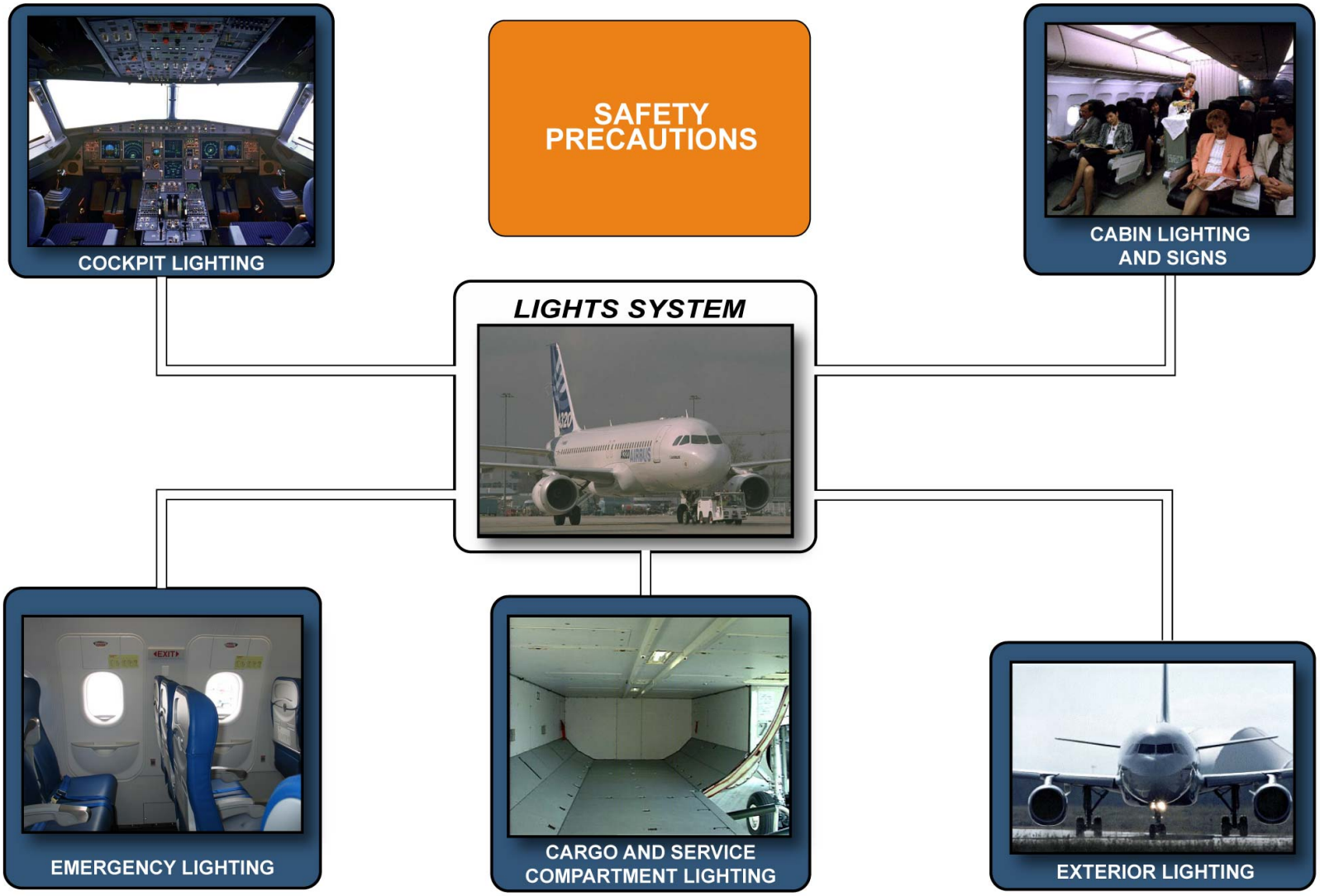


MAINTENANCE/TEST FACILITIES

33 LIGHTS SYSTEM PRESENTATION (1)

GENERAL

The lighting system includes:
- cockpit lighting,
- cabin lighting and signs,
- emergency lighting,
- cargo and service compartment lighting,
- exterior lighting.


SAFETY PRECAUTIONS
COCKPIT LIGHTING
CABIN LIGHTING AND SIGNS
LIGHTS SYSTEM
EMERGENCY LIGHTING
CARGO AND SERVICE COMPARTMENT LIGHTING
EXTERIOR LIGHTING

GENERAL

33 LIGHTS SYSTEM PRESENTATION (1)

COCKPIT LIGHTS SYSTEM

The cockpit lighting system include:
- panel and instrument lighting,
- general cockpit lighting (dome light),
- ambient lighting.

COCKPIT LIGHTS CONTROL

The cockpit panels and instrument lighting controls are operated from:
- three different panels,
- and underneath the glareshield.

Two supplementary reading lights are operated from each side of the upper part of the overhead panel. Each reading light potentiometer controls the brightness of the related reading light.

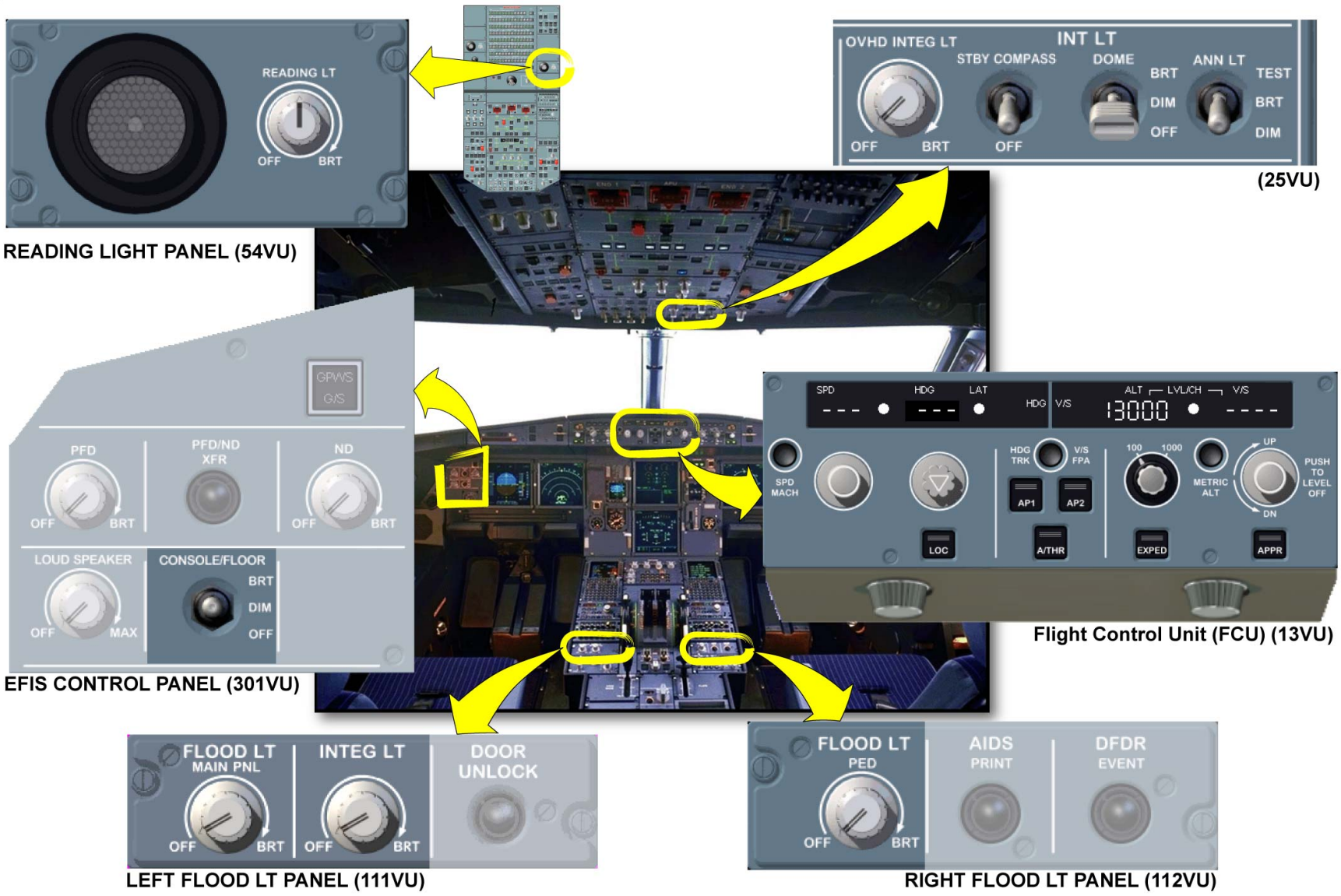
The internal light panel contains the controls for the overhead panel integral lighting, standby compass integral light, the dome lights, and the annunciator lights.

Two potentiometers underneath the glareshield control the integral lighting of the glareshield and Flight Control Unit (FCU) displays.

The FLOOD LT potentiometers control the flood lights of their respective areas and the INTEG LT potentiometer, the main panel and pedestal lighting.

The side console light controls are controlled from the left and right sides of the main instrument panel.

UGB13131 - U2AT4M0 - UM33PZ00000002



COCKPIT LIGHTS SYSTEM - COCKPIT LIGHTS CONTROL

33 LIGHTS SYSTEM PRESENTATION (1)

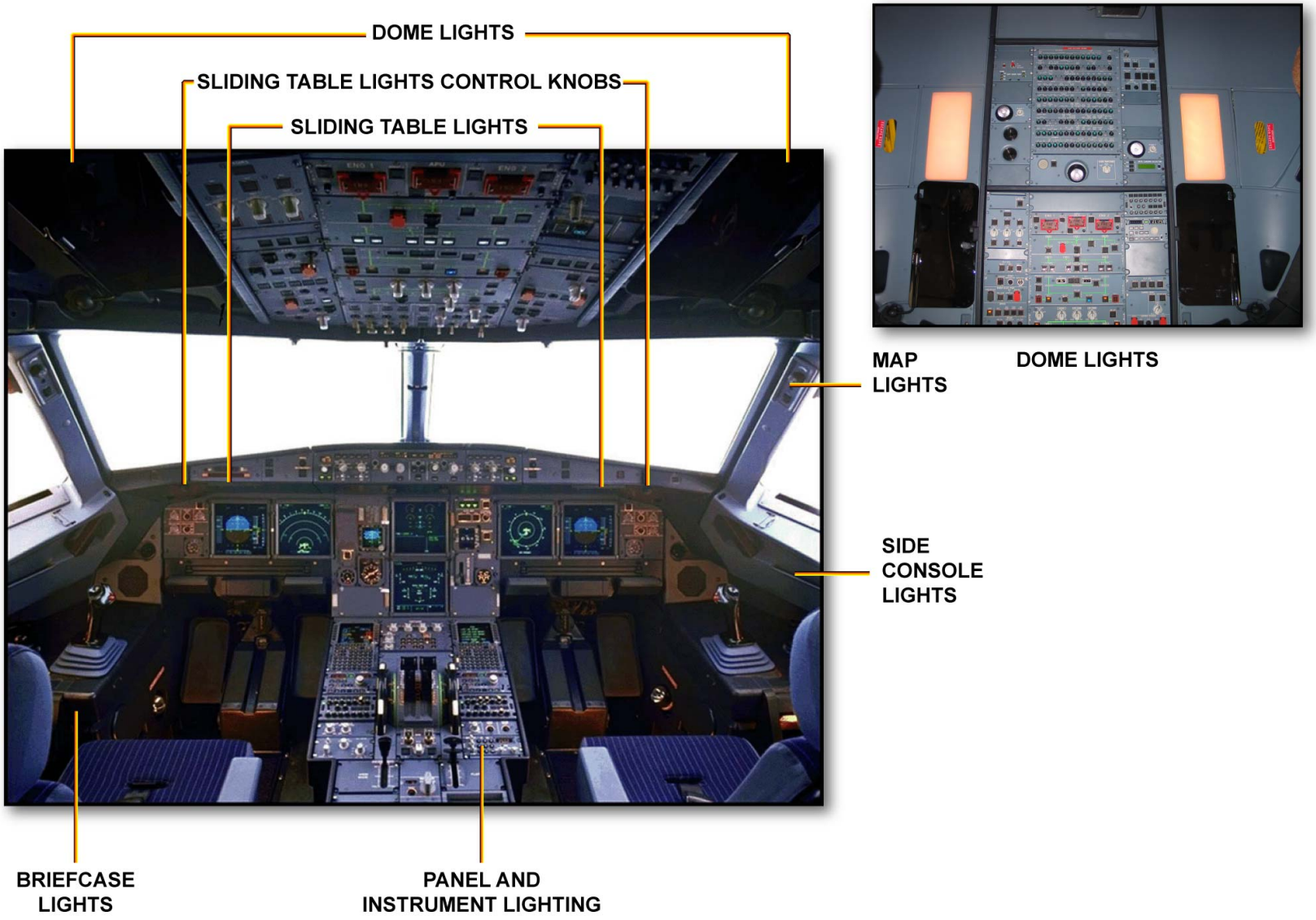
COCKPIT LIGHTS SYSTEM (continued)

COCKPIT LIGHTS

The general cockpit lighting is supplied by the dome lights.
The ambient lighting is supplied by:
- two supplementary reading lights installed on each side of the upper part of the overhead panel.
- Side console lights bring light to:
- the side consoles,
- briefcase areas,
- the floor around the pilot seats.
- Two map lights are controlled by a potentiometer each for brightness control and a slider for beam control.

Two lights bring light to the sliding tables and the map holder. Two knobs adjust the brightness of these 2 lights.

UGB13131 - U2AT4M0 - UM33PZ00000002



COCKPIT LIGHTS SYSTEM - COCKPIT LIGHTS

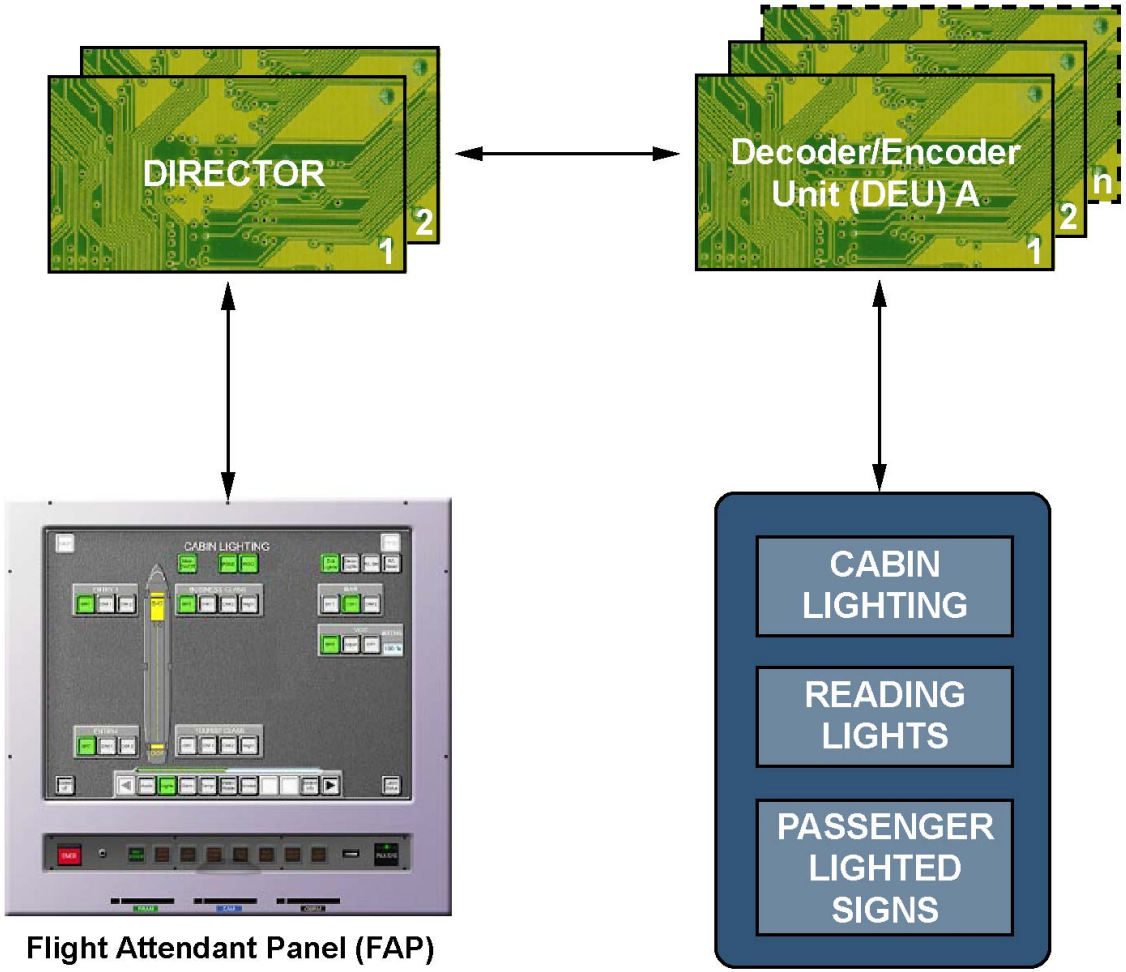
33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS

CABIN LIGHTS THROUGH CIDS

Various cabin light and sign systems are controlled, tested, and monitored by the Cabin Intercommunication Data System (CIDS). The CIDS includes two directors, the Flight Attendant Panel (FAP), and the DEUs. The touch screen FAP controls and indicates the status of the CIDS. Integrated within the FAP are Cabin Assignment Module (CAM), On Board Replaceable Module (OBRM) and Prerecorded Announcement and Music (PRAM) in flash card format.
The director communicates through Decoder Encoder Units (DEUs) with the cabin, passenger and crew systems.

UGB13131 - U2AT4M0 - UM33PZ00000002



CABIN LIGHTS - CABIN LIGHTS THROUGH CIDS

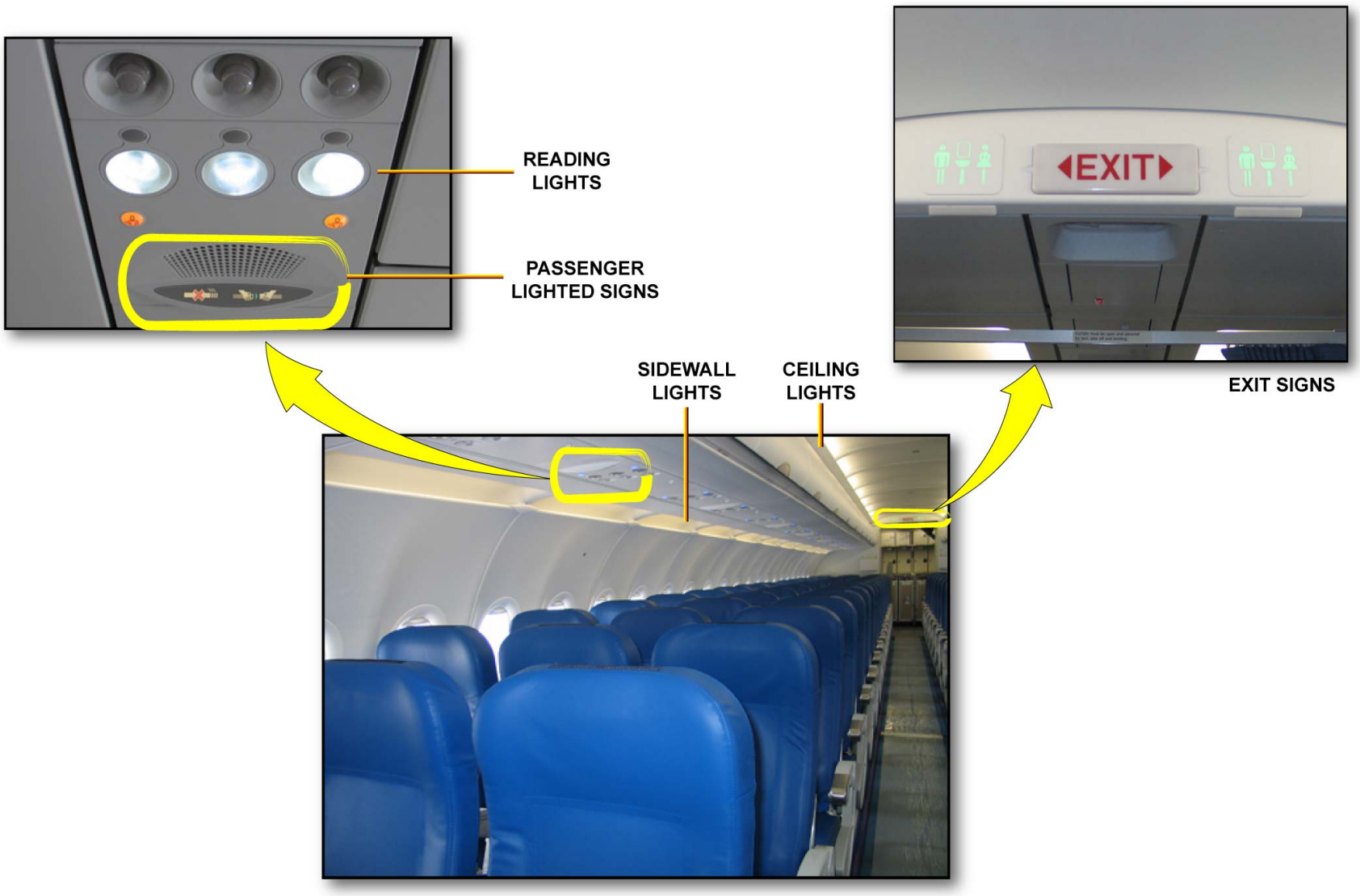
33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS (continued)

CABIN LIGHTS AND SIGNS

The CIDS controls and monitors the cabin lights through the FAP.
The CIDS also controls:
- the passenger lighted signs,
- the passenger reading lights,
- the passenger calls.

UGB13131 - U2AT4M0 - UM33PZ00000002



CABIN LIGHTS - CABIN LIGHTS AND SIGNS

33 LIGHTS SYSTEM PRESENTATION (1)

CABIN LIGHTS (continued)

PURSER STATION

The FAP display structure is made of different pages related to the different systems connected to the CIDS.
The FAP is used for monitoring, control and testing. The MCDU provides a testing interface.

Flight Attendant Panel (FAP)

CABIN LIGHTS - PURSER STATION

33 LIGHTS SYSTEM PRESENTATION (1)

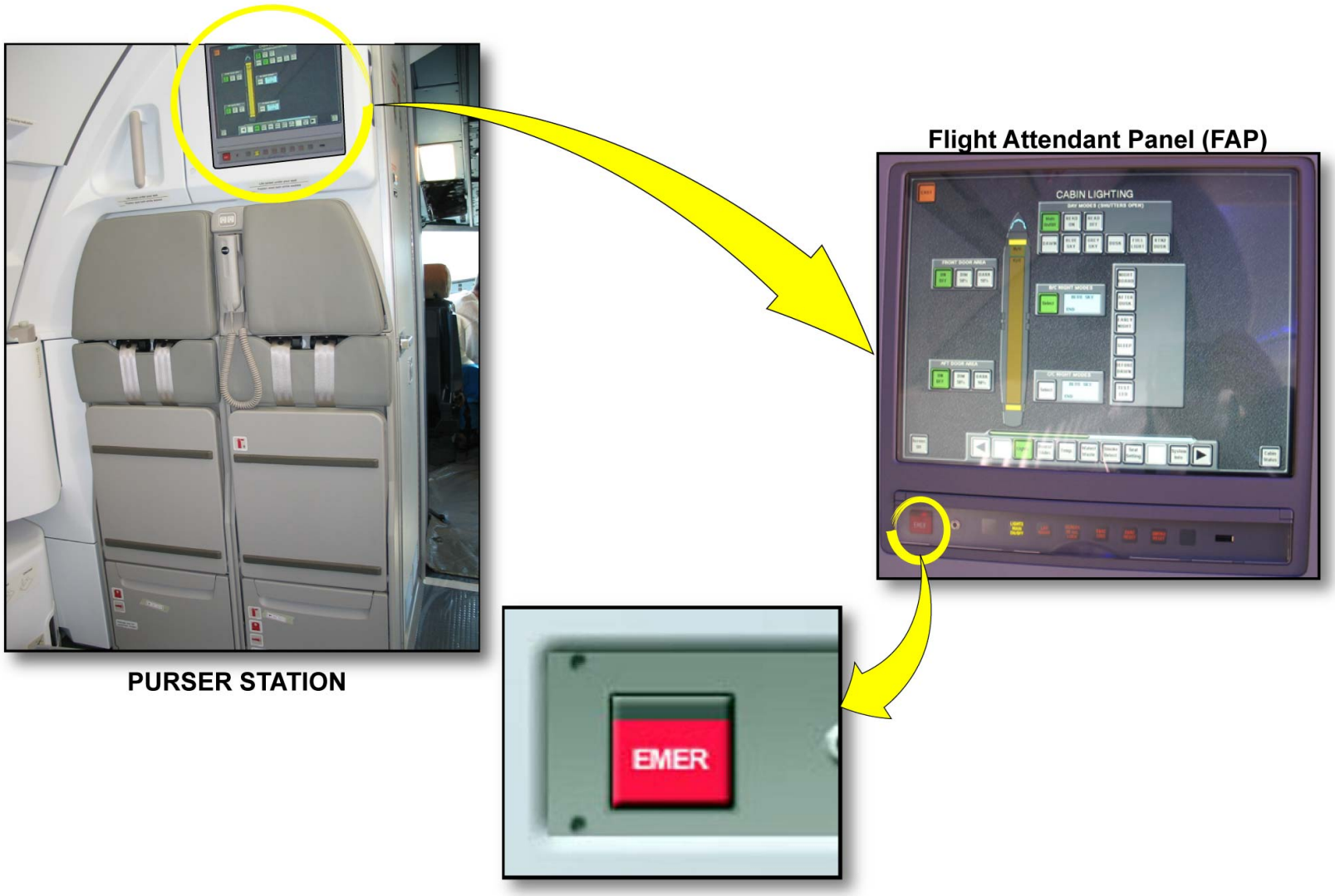
EMERGENCY LIGHTS

Emergency lights are installed in the cabin and on the exterior fuselage for overwing emergency exits.
The cabin emergency lights are lamps in the cabin ceiling panels.
In order to get the sufficient lighting of the aisle, exits and emergency exits, lights are installed on the left aisle seats and near the passenger doors and wing exits.
The exterior emergency lights come on automatically whenever the escape slide is deployed. The lights are supplied from the cabin emergency power supply units.

CONTROL AND INDICATING

The emergency-lighting system can be controlled by the control switch EMER EXIT LT from the overhead cockpit control panel.
The red EMERgency pushbutton has the same function as the cockpit EMER EXIT LT switch in the ON position.

EMERGENCY LIGHTS - CONTROL AND INDICATING



EMERGENCY LIGHTS - CONTROL AND INDICATING

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33 LIGHTS SYSTEM PRESENTATION (1)

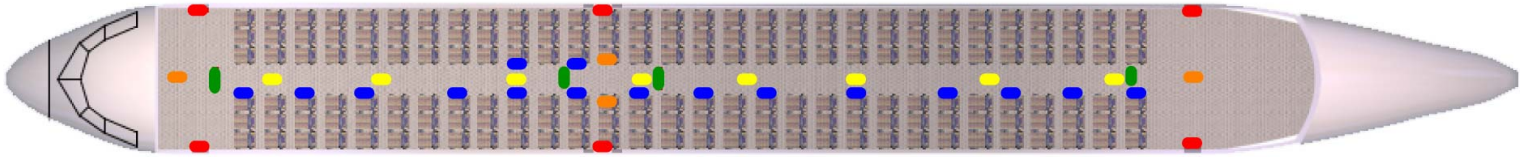
EMERGENCY LIGHTS (continued)

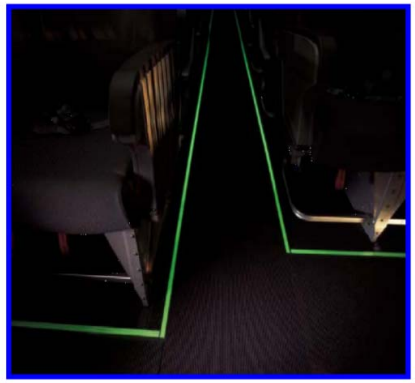
COMPONENT LAYOUT

Emergency lights in the cabin include EMERGENCY EXIT signs, Ceiling EMERGENCY lights, ESCAPE PATH lighting, The emergency lights are supplied by several Emergency Power Supply Units (EPSUs).

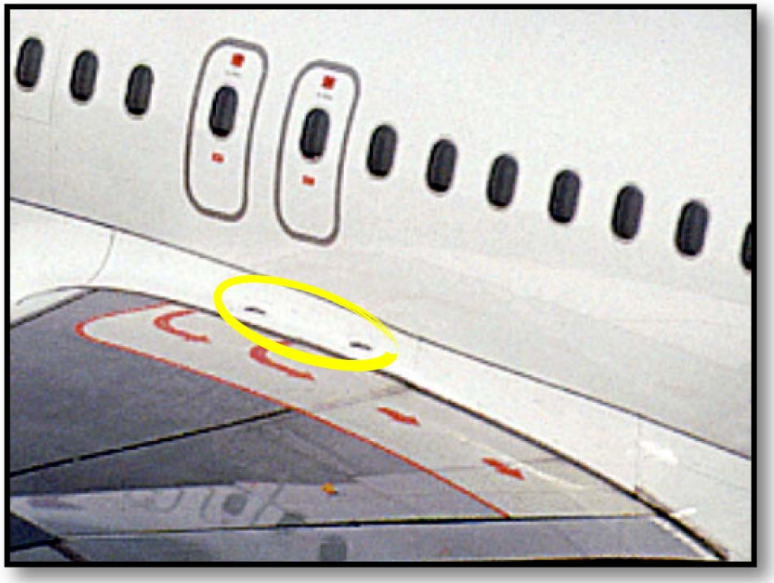
In the fuselage, there are 4 exterior emergency lights. These lights are automatically activated when an overwing emergency exit door is opened in the armed configuration. The lights come on all along the escape route leading to the aft wing slide. Each escape slide has integrated lighting strips.

UGB13131 - U2AT4M0 - UM33PZ00000002





EMERGENCY LIGHTS - COMPONENT LAYOUT



EMERGENCY LIGHTS - COMPONENT LAYOUT

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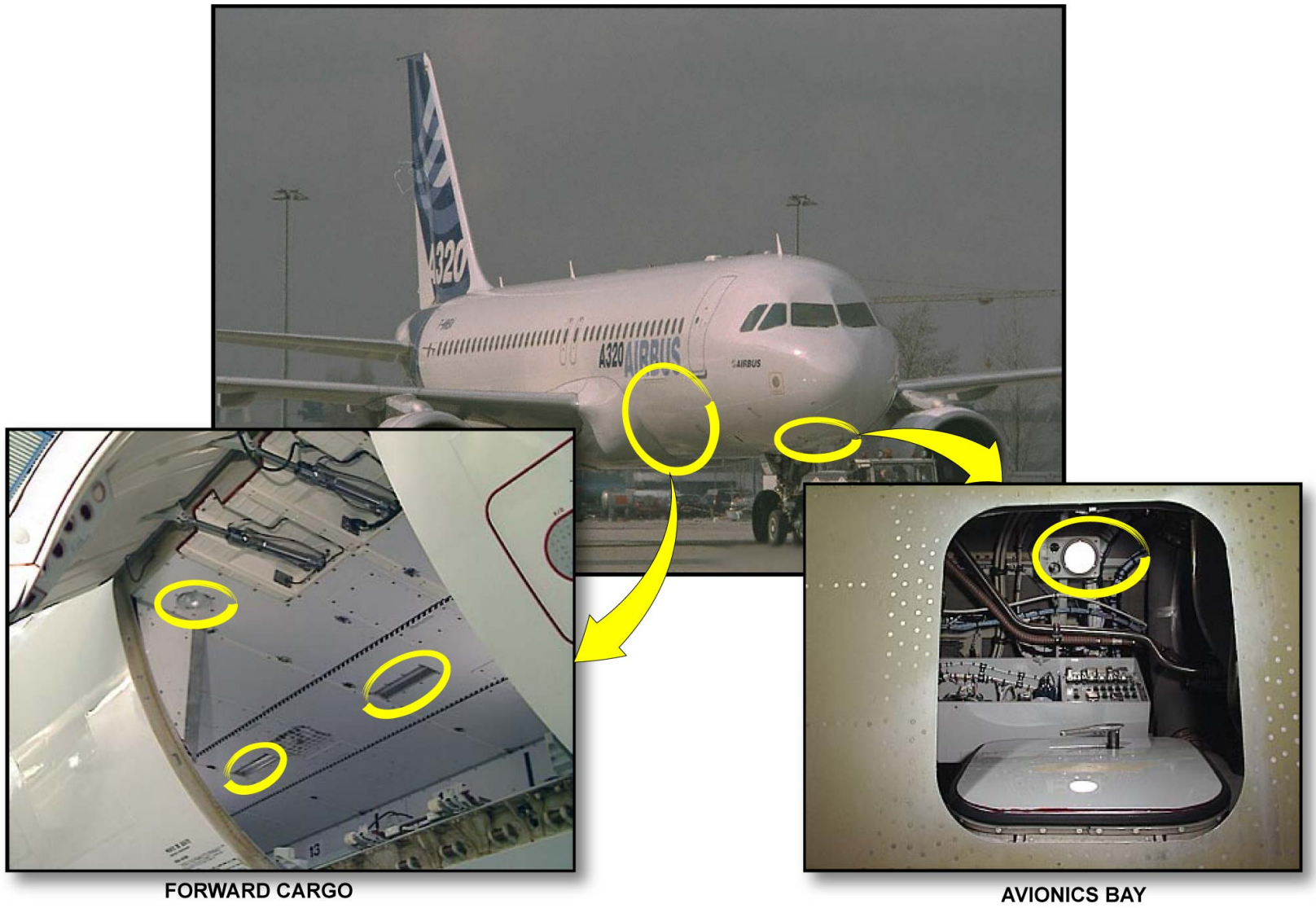
33 LIGHTS SYSTEM PRESENTATION (1)

CARGO AND SERVICE COMPARTMENT LIGHTS

The graphic shows the different cargo and avionics compartment lights.



CARGO AND SERVICE COMPARTMENT LIGHTS

33 LIGHTS SYSTEM PRESENTATION (1)

EXTERIOR LIGHTS

CONTROLS

The operation for all external lights is on the EXT LT panel on the overhead panel.

(25VU)

EXTERIOR LIGHTS - CONTROLS

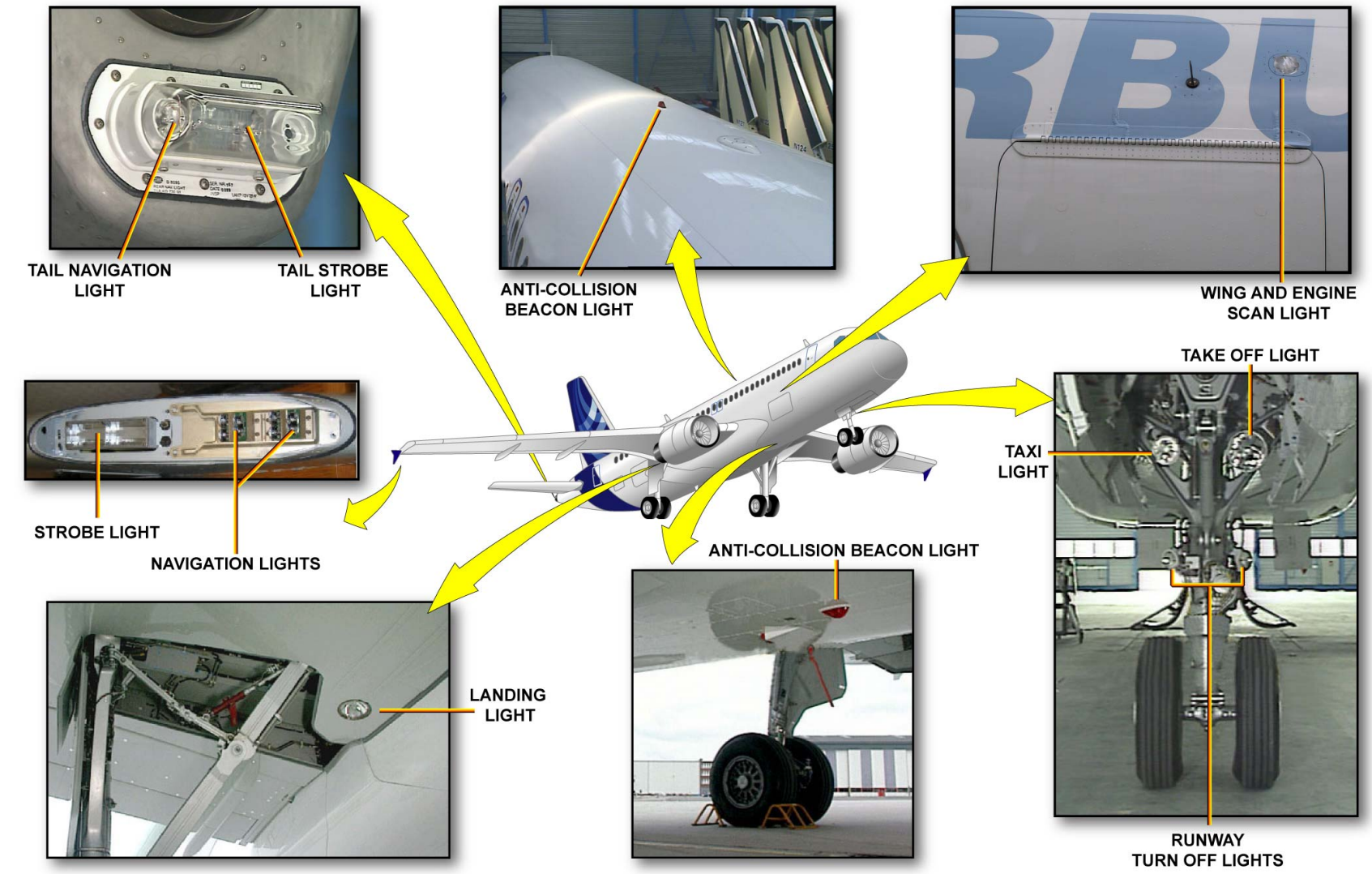
33 LIGHTS SYSTEM PRESENTATION (1)

EXTERIOR LIGHTS (continued)

COMPONENT LAYOUT

The exterior lighting system include:
- taxi, turn off lights,
- navigation, strobe, beacon, wing lights,
- take off and landing lights.

UGB13131 - U2AT4M0 - UM33PZ00000002



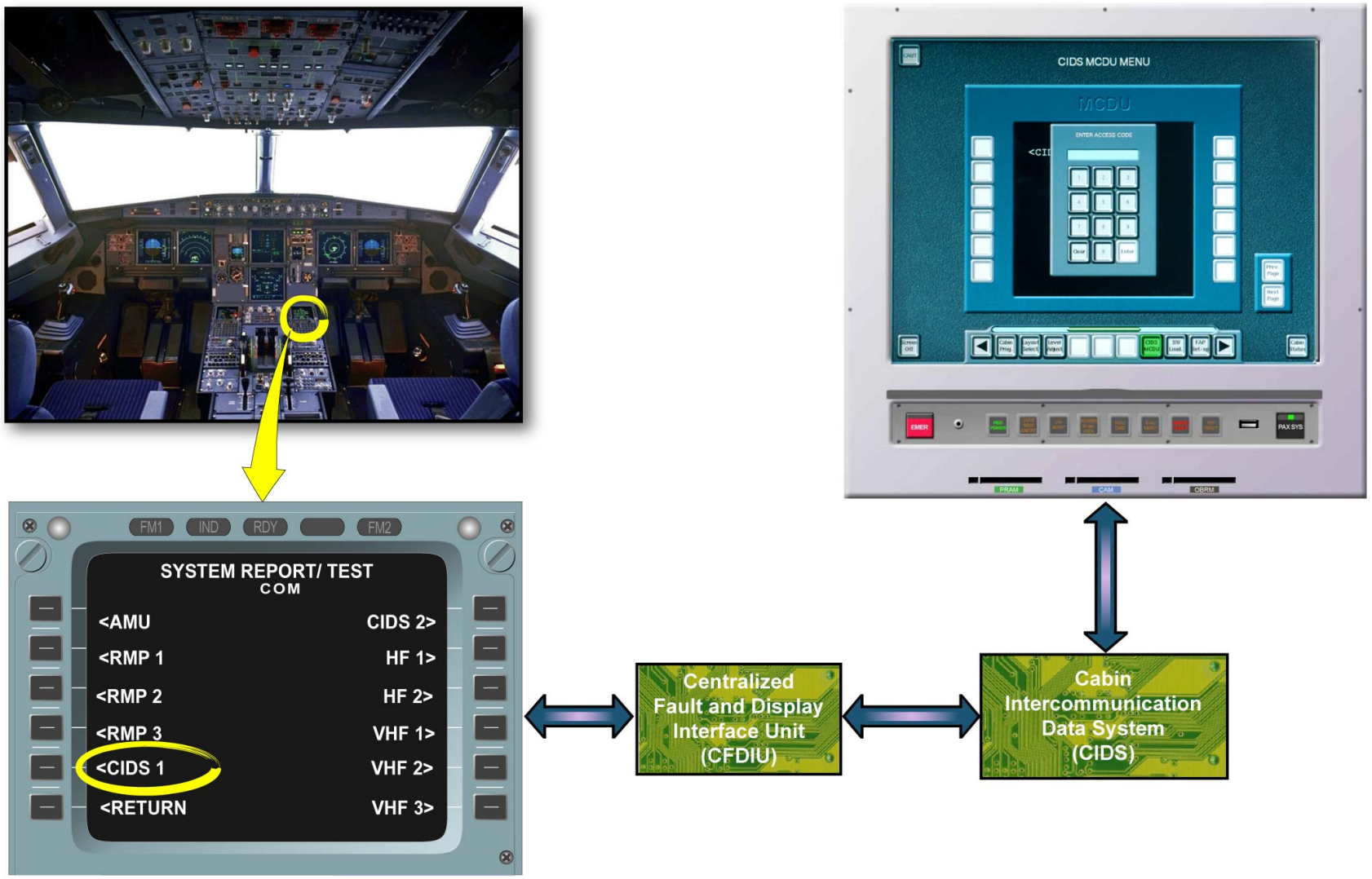
EXTERIOR LIGHTS - COMPONENT LAYOUT

33 LIGHTS SYSTEM PRESENTATION (1)

MAINTENANCE/TEST FACILITIES

The CIDS related lights system can be monitored and tested via the MCDU.
The CIDS BITE is accessible from the MCDU through the Centralized Fault Display Interface Unit (CFDIU) or from the FAP, like it is possible on the MCDU in the cockpit. This page is protected by a password.

UGB13131 - U2AT4M0 - UM33PZ00000002



MAINTENANCE/TEST FACILITIES

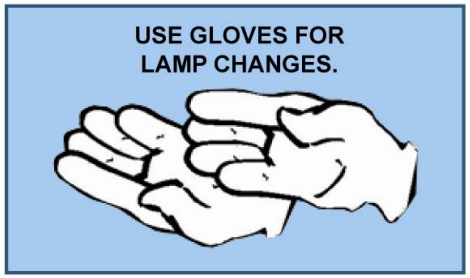
33 LIGHTS SYSTEM PRESENTATION (1)

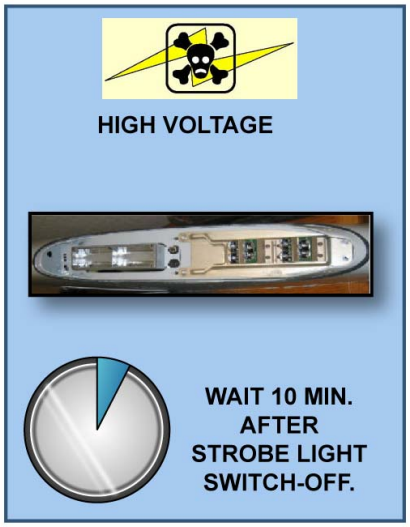
SAFETY PRECAUTIONS

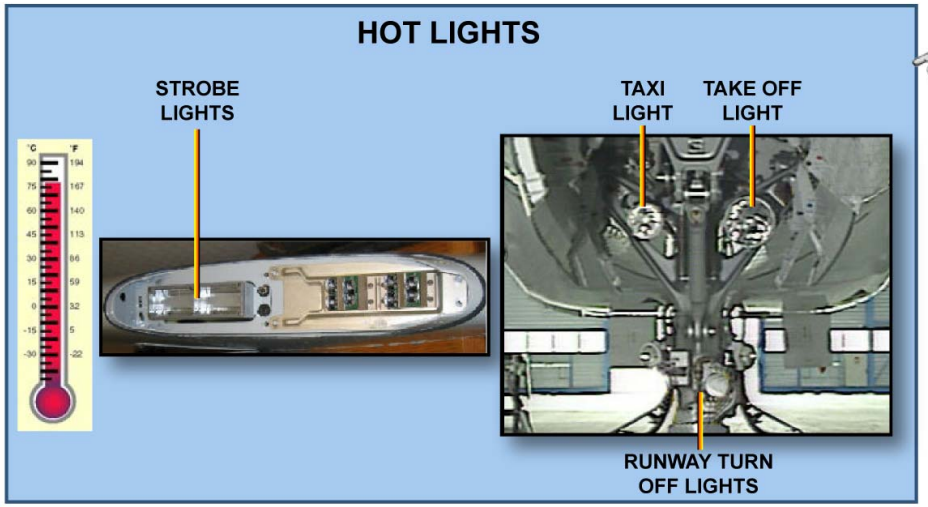
When you work on the lights system, make sure that you obey all the Aircraft maintenance Manual (AMM) safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of main safety precautions related to the lights system.
Isolate the electrical circuits from the related equipment and the environment to prevent injury to persons and/or aircraft damage.
Do not disconnect the electrical connections for at least two minutes after you de-energize the electrical circuits.
When you change a lamp, do not touch the glass with your fingers. The oil from your skin will quickly cause deterioration of the lamp. If you accidentally touch the lamp glass, clean it with a lint-free cloth.
Do not look directly towards the lights without eyes protection. Their intensity can be high enough to cause permanent damage to your eyes.
Make sure that there are no signs of fuel contamination in the landing light assembly. If you find fuel contamination, no person must operate the landing light until:
- you repair the fuel leak,
- you replace the landing light assembly.

If you do not obey this precaution, ignition of the remaining fuel in the landing light can occur.
Put the safety devices and the warning notices in position before you start a task on or near:
- the flight controls,
- the flight control surfaces,
- the landing gear and the related doors,
- components that move.

Do not remove a strobe light for at least ten minutes after you de-energize the electrical circuits. The high voltage electrical current in the capacitor of the strobe light is dangerous.
Do not touch the strobe lights for at least 5 minutes after operation. The strobe light will still be hot. Use gloves when removing lamps, oils from your skin can deteriorate the life of the bulbs.
Be careful if you touch the strobe light with the cover removed and the power on. Some components have dangerous voltages.







SAFETY PRECAUTIONS

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